the BIG SWING is to

DUNCAN **MILLER** MANUAL

DUNCAN **AUTOMATON** AUTOMATIC

Over 1100 Cities, and more than 500,000 meters.

DUNCAN PARKING METER CORP.

835 N. WOOD ST. CHICAGO 22, ILL.

Factory at Harrison, Arkansas

Manufacturers of the DUNCAN-AUTOMATON fully automatic and the DUNCAN-MILLER manual parking meters.

Modernization

IN PHILADELPHIA

PHILADELPHIA'S Chestnut Street, one of the first streets in America to be electrically illuminated, is one of the first streets to be relighted in the city's new street lighting modernization program.

The program is a joint venture, extending over 15 years, between the city and the Philadelphia Electric Company, and is typical of projects in other cities.

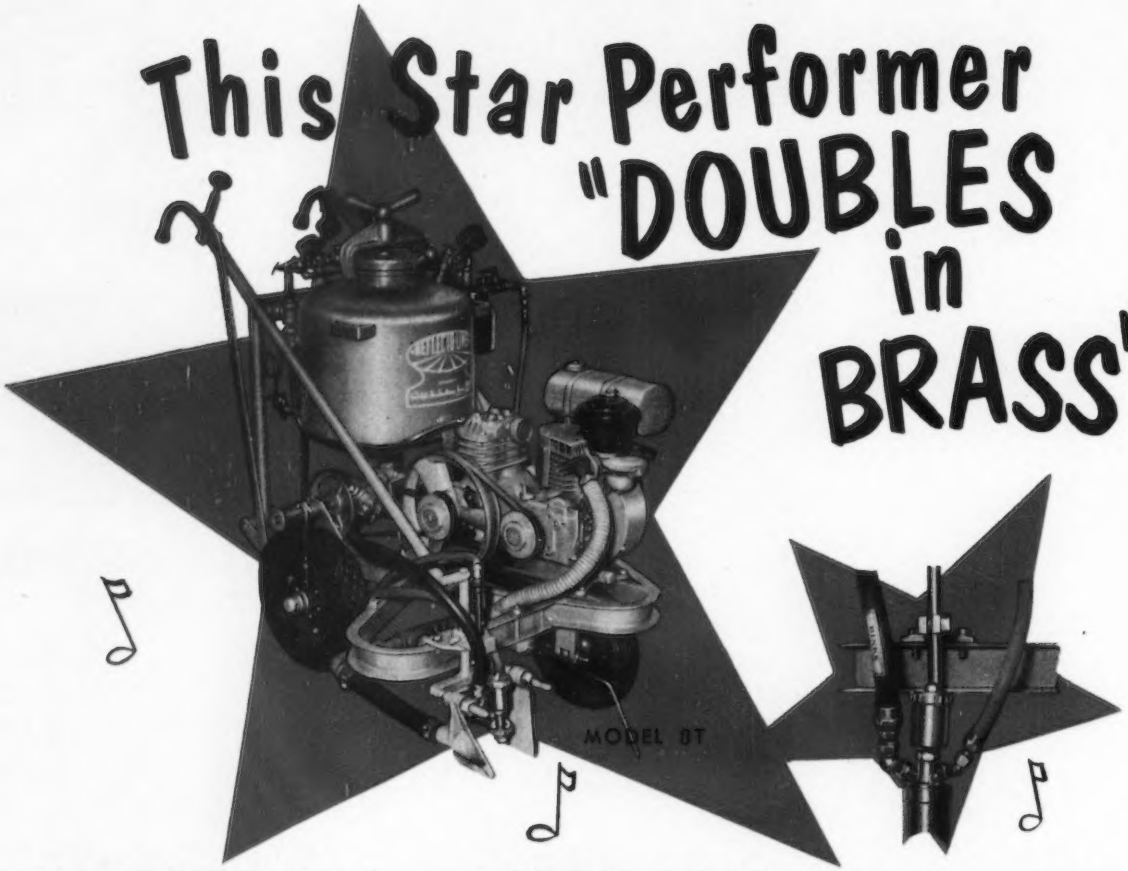
Write The Union Metal Manufacturing Company, Canton 5, Ohio, for further information on Monotubes—the most modern street lighting poles.

Chestnut Street, Philadelphia, Pa.
Union Metal Monotubes, 30' 8" tall, equipped with a four-foot bracket, support the modern luminaire.

UNION METAL

Monotube Street Lighting Poles

This Star Performer "DOUBLES in BRASS"



For MUNICIPAL and INDUSTRIAL Striping Jobs

. . . plays sweet music on your balance sheet

Wald REFLECTO-LINER

Don't listen to those "Balance Sheet Blues." In its class, this lightweight, single-line spray machine gets top billing! Self-propelled, it delivers maximum operating efficiency in either municipal or industrial applications—handles plain paint or reflective marking material with equal ease—saves time and money.

Top quality results every time with the Nu-Matic Spray Gun. Airblast curtains give sharp line definition to within one inch of curb. The contour Shroud —a Wald exclusive (see insert) may be supplied as an alternate—lays a clean-cut, uniform line, 2 to 6 inches in width.

Wald Industries Inc.

Write or phone today for more information on the star of YOUR *show, the Wald Reflecto-Liner.*

REFLECTO-LINER

WALD INDUSTRIES, Inc.

HUNTINGDON, PA.

For complete details, write for bulletin No. 508

Traffic Engineering

OFFICIAL PUBLICATION OF THE INSTITUTE OF TRAFFIC ENGINEERS

VOLUME XXIII | AUGUST, 1953 | NUMBER 11

COVER: An aerial view of downtown Buffalo, scene of the Institute's 24th Annual Meeting September 28th through October 1st. In center foreground is the back of the magnificent 24 story City Hall which faces Niagara Square (traffic circle) immediately beyond, in which stands the McKinley Monument. The large building standing at the left of Niagara Square is the 20 story Statler Hotel, headquarters for the Institute's convention. In the middle distance slightly left of center is the soldiers and Sailors Mounment standing in Lafayette Square, starting point of the tour mentioned in Mr. Gibbons' article on Buffalo appearing in this issue. This view is from northwest to southeast; Lake Erie and Buffalo's waterfront is about a third of a mile out of the picture southwest of the lower right corner.

Traffic Engineering is that phase of engineering which deals with the planning and geometric design of streets, highways, and abutting lands, and with traffic operation thereon, as their use is related to the safe, convenient, and economic transportation of persons and goods.

INSTITUTE OFFICERS

F. BRUCE CRANDALL
President

DONALD M. MCNEIL
Vice-President

HARRY PORTER, JR.
Vice-President

CHARLES W. PRISK
Secretary-Treasurer

PUBLICATION STAFF

M. MANSFIELD TODD
Editor

S. G. NOWELL, JR.
Business Manager

Associate Technical Editors
ROBERT S. HOLMES, EDMUND R. RICKER
MARTIN C. STARK

Associate Editors

H. A. BARNES — R. H. HARLESTON, JR.
H. M. BATTS, JR. — C. S. LECRAW, JR.
J. A. CARROTHERS — EUGENE MAIER
C. C. CLARK — S. T. SIEGEL
NORMAN KENNEDY

May We Offer . . .

How to Plan and Pay for Better Highways 375
Claude A. Rothrock
Ancient Street Patterns 384
Taylor D. Lewis
Buffalo 388
Edward F. Gibbons
Traffic Trends 389
Traffic Signals That Think 390
Charles R. Waters
Reference Notes 392
Arnold G. Fisch
Traffic News 395
New Appointment 396
Position Available 396
Letter to the Editor 399
Secretary's Column 401
Looking Ahead 401
Yearbook Changes and Corrections 404
Index to Advertisers ..... Inside Back Cover

Published Monthly by the

Institute of Traffic Engineers

PUBLICATION office:
Interstate Printing Corp.
400 Watchung Avenue
Plainfield, New Jersey

EDITORIAL AND ADVERTISING offices:
Strathcona Hall
New Haven 11, Connecticut

Entered as second-class matter November 7, 1941, at the Post Office at Plainfield, New Jersey, under Act of March 3, 1879. ¶Single copies 40 cents, subscription price $3.50 per year in the United States; $4.75 per year to foreign countries. Other publications of the Institute of Traffic Engineers include Annual Proceedings, Traffic Engineering Handbook and Technical Bulletins. ¶The Institute is not responsible for any statements made or opinions expressed in its publications. Publication of advertising does not constitute Institute approval or endorsement of the products or services advertised. Permission to reprint contents with customary credit line is given unless otherwise stated.

WHY TRAFFIC EXPERTS CHOOSE DUAL METERS

6 REASONS WHY DUALS stand the "gaff" and give better service longer!

1. **SETH THOMAS CLOCK MOVEMENT...** Backed by the world's most famous fine clock maker.
2. **STAINLESS STEEL COIN MECHANISM** ... Smoother running in all weather conditions.
3. **WEATHERPROOF HEAD...** With handy work-shelf door.
4. **SUPERIOR DESIGN...** Discourages cruising; time indicator visible only from sidewalk side.
5. **ON-THE-STREET TIME-AND-COIN CONVERSION...** To meet changing traffic conditions.

✓ **EASY TO PATROL AND OPERATE ...** Observation window shows slug or tampering at a glance. No levers to move.

✓...Duals are easier to operate and enforce

SIMPLICITY of operation and patrol are two important reasons why Dual Automatic *Gearshift* Parking Meters are popular with leading traffic engineers everywhere.

The motorist simply deposits a coin and Dual meters do the rest . . . no handles, levers or plungers to turn, pull or push. Shoppers especially appreciate this automatic feature.

Traffic departments in Dual cities have their own reasons for liking Dual meters. 1) Slugs or tampering can be detected at a glance. 2) Cruising is discouraged because the time dial is visible only on the sidewalk side. This feature alone builds revenue. 3) The bold red expired flag can be seen at a glance by the patrolling officer. 4) Dual meters are built to give longer, trouble-free service. 5) Time and coin changes can be made on the street as traffic conditions warrant.

Before you install any meter, weigh these Dual advantages. And learn about the specialized service available to every Dual-equipped city. Whether you choose the popular Dual single head or the new Dubl Dual . . . you'll get the precision built meter that's setting the pace in parking service and efficiency. Write today for Bulletin DU-521 for on-street parking; Bulletin DU-522 for off-street parking.

Single head and Dubl Dual meters have the same efficient automatic mechanisms—one in the single head; two independent mechanisms in the Dubl Dual.

THE DUAL PARKING METER COMPANY

A subsidiary of The Union Metal Manufacturing Company

Canton 2, Ohio

Frankly Speaking

THE "MASTER" PLAN

THROUGHOUT THESE UNITED STATES, cities are preparing comprehensive plans for their development with the objective of making them better places in which to live and work.

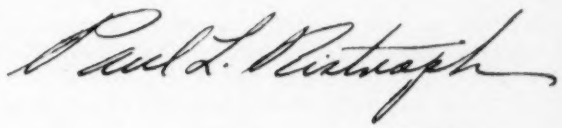
These plans encompass such items as the regulation of land use, the location of parks, schools and playgrounds, the regulation of building heights, densities and their use, etc., and—most important to the traffic engineer—the location and nature of surface transportation facilities such as streets, highways, and transit routes. Those responsible for preparing the recommendations usually have a background of training and experience that enable them to integrate the various components into a comprehensive whole designed to promote the improvement of the community and the general welfare of the people in an orderly and economical manner.

However, with rare exceptions, planners cannot be expected to be experts in every phase of the community problem. Neither can the traffic engineer be expected to be an expert in all phases of city planning. Both should work together toward their common objectives: The traffic engineer from the viewpoint of convenient, economical and safe movement of people and materials; the city planner from the overall viewpoint and each with the objective of obtaining a coordinated and workable plan within the economic potential of the community.

Some advantages of such planning are that teamwork and understanding are evolved, and confusion and inefficient use of public funds and effort are minimized. An outstanding example is the relationship between the development of streets, highways and mass transit routes and the control of sub-divisions. Often needed right-of-way can be obtained without cost to the municipality through the exercise of sub-division control. Review of sub-division plans by the traffic engineer prior to their approval may result in better arrangement of the streets to service traffic and transit needs of the people.

Another example is exaggeration of the "neighborhood unit concept" which might well result in isolated units that cannot be economically or efficiently served by mass transit or which leave a scarcity of alternate routes for use when a major street is blocked by construction, repair, accident, fire, or other incidents or conditions.

By participating in city planning the traffic engineer gains in perspective and elicits the understanding of others in his own problems. The city planner is the architect of the city plan; the city resulting therefrom is the workshop of the traffic engineer. He should take part in designing his own workshop.



Director

Shuffle Off To Buffalo

Gather up your extra scanties
Have your wife pack up her panties
And be ready when it's off we go
To Institute meeting number twenty-fo
Shuffle off–shuffle off to Buffalo!

Hotel Statler, Buffalo, N. Y.
September 28—October 1, 1953

24th ANNUAL MEETING

INSTITUTE OF TRAFFIC ENGINEERS

PROGRAM — TECHNICAL SESSIONS

TECHNICAL SESSION No. 1, Tuesday, September 29, 9:30 A.M.-12:00 N.

1. The New York State Thruway and State Highway Projects—B. A. Lefeve, Director, Bureau of Highway Planning, New York State Department of Public Works, Albany, New York.
2. Buffalo Urban Highway Projects—Dr. Charles R. Waters, District Engineer, New York State Department of Public Works, Buffalo, New York.
3. Erie County Expressway Plan—H. Dale Bossert, P.E., Director, Erie County Planning Commission, Buffalo, New York.
4. Buffalo's Present and Future Parkway System—A. Russell Tryon, Director, City Planning Commission, Buffalo, New York.
5. Buffalo's Parking Garages—Welles V. Moot, Chairman, Division of Parking, Buffalo, New York.
6. Short description of afternoon caravan.

FIELD TRIP, Tuesday, September 29, 1:30 P.M.—Niagara Frontier and Falls.

TECHNICAL SESSION No. 2, Planning, Wednesday, September 30, 9:00 A.M.-12:00 N.

1. Redevelopment and Traffic—William H. Claire, R.A., Redevelopment Planning Architect, Los Angeles Community Redevelopment Agency.
2. Shopping Centers—Lloyd B. Reid, P.E., Traffic Engineering Consultant, Detroit, Michigan.
3. Parking Criteria and Relationship of Retail Sales to Parking—Henry K. Evans, P.E., Highway Transportation specialist, U. S. Chamber of Commerce, Washington, D. C.
4. Transit Developments in Toronto—W. E. P. Duncan, P.Eng., General Manager, Toronto Transportation Commission, Ontario, Canada.

TECHNICAL SESSION No. 3, Operation, Wednesday, September 30, 2:00 P.M.-5:00 P.M.

1. Traffic Engineering Implications in Toll Facilities—Edmund R. Ricker, Traffic Engineer, New Jersey Turnpike Authority, Trenton, New Jersey.
2. Driver Characteristics and Highway Operation—Dr. Theodore W. Forbes, National Research Council, Washington, D. C.
3. The Pennsylvania Turnpike Joint Safety Research Project—Paul K. Eckhardt, Supervising Engineer.
4. Sign Erection, Techniques, and Maintenance—Roger T. Chandler, P.E., Acting Traffic Engineer, Providence, Rhode Island.

TECHNICAL SESSION No. 4, Administration, Thursday, October 1, 9:00 A.M.-12:00 N.

1. Effect of Limited Access Highways on Property and Business Values—Richard M. Zettel, Institute of Traffic and Transportation Engineering, University of California, Berkeley, California.
2. The Field of Modern Interconnected Traffic Control Signals—Harry A. Haugh, Automatic Signal Division, East Norwalk, Connecticut.
3. Light and Night Traffic Accidents—David M. Baldwin, Traffic Division, National Safety Council, Chicago, Illinois.
4. Traffic Controls in the Vicinity of School Zones—Lawrence Lawton, P.E., Engineer of Traffic Design, Department of Traffic, City of New York.

SPECIAL FIELD TRIPS, Thursday, October 1, 2:00 P.M.

How to Plan and Pay for Better Highways

By Claude A. Rothrock (Mem., ITE)

State Planning Engineer, West Virginia State Road Commission,
Charleston, West Virginia

(This paper won the 3rd National Award of $5000 for Mr. Rothrock in the GENERAL MOTORS BETTER HIGHWAYS AWARDS Contest which was conducted in the early part of this year. TRAFFIC ENGINEERING appreciates receiving the consent of the author and General Motors to publish this winning essay. EDITOR.)

Foreword

This essay is submitted as an entry in the GENERAL MOTORS BETTER HIGHWAYS AWARDS contest. The subject of modern highways, including the engineering and financial aspects, with the wide range of subsidiary phases and their impact upon the National economy, is so vast and complex that any discussion as short as this must necessarily omit much of importance. Only those items of greatest significance are considered, and they briefly.

Where figures are quoted they are the latest available at the time of writing, but which in the interim may have been supplanted with others more accurate or of a later date.

The suggestions are offered upon the supposition that the administrations are properly organized for most efficient action, and are free of politics. Where this is not true, preliminary corrective measures will be required.

The methods of financing suggested here are not new or novel. They are generally accepted as sound methods of proven worth. What is new is the suggestion for a genuinely concerted effort, by the divergent national interests now working at cross purposes, accompanied by a reconciliation of their differences. If this can be achieved, and it must be, the solution to the highway problem will come almost automatically.

"I CAN SOLVE ANY PROBLEM, EXCEPT THOSE THAT AREN'T ANSWERED AT THE BACK OF THE BOOK."

MARK TWAIN

Introduction

Probably no factor of the growth of the United States has had such a profound effect upon the economic welfare of the country and its citizens as transportation. Transportation alone made possible the expansion of this country from the first few scattered original colonies, (themselves only made possible by overseas transportation) to the present vast and far-flung, albeit closely united, aggregate of economic relationships which comprises our nation. As new methods of transportation have been developed, and communication made easier, so has mankind's existence been made more fruitful and satisfying.

Of the present day methods of transportation that by motor vehicle is one which, although a development of only the last 3 or four decades, probably has touched the lives and more greatly influenced the economic and social welfare of more people in the United States than any other single factor in the country's recent history. Today motor vehicle transportation is one of the most important components of our nation's economy.

Importance of Motor-Vehicle Transportation

CONSIDER THESE FACTS: There are more than 3 billion miles of rural roads and 319 thousand miles of city streets in the United States today. There are now more than 50 million motor-vehicles using these highways, of which more than 9 million are trucks and buses. Annually these vehicles travel 340 billion passenger miles, and carry 130 billion ton miles of long-range freight. This is twice as much traffic as was carried by motor vehicles 15 years ago, and the traffic is increasing steadily at the rate which will produce double the present volumes in the next 10 to 15 years. There is one passenger car for every 3.5 persons and one truck for every 18 persons of our population. One worker out of seven gains his livelihood from some branch of automotive transportation.

The figures of the financial outlay involved are equally astonishing: Retail sales of automotive products alone was reported at $26 billion dollars in 1948 and it is estimated that the cost of the vast array of businesses and services which constitute motor vehicle transportation amounts to over $40 billion dollars annually—more than one-seventh of the national economy.

Lack of Balanced Service

In spite of our growing dependence upon motor-vehicle transportation, however, we find that, within its own boundaries this industry is probably the most unbalanced service ever to exist in such tremendous proportions.

The reasons for this situation are several. In the first place highway engineers of the 20's and 30's failed to foresee the tremendous developments that would come as a result of their work, and it was not until the beginning of the last decade that the seriousness of the situation began to be actually realized. By the time the engineers discovered the extent of their predicament, the crisis of World War II forced road construction to cease. The demands for the movement of goods by motor vehicle, however, reached new heights during the war period. In the meantime the inflationary forces of the war, and its aftermath, have increased the costs of highway construction to more than double those of the pre-war period; and, although the motor vehicle owner has been willing under the compulsion of these same forces of inflation to pay the resulting higher prices for new and improved vehicles, equipment and other things necessary to his motor-vehicle transportation, he has successfully resisted increases in a similar ratio in the license fees and fuel taxes considered necessary to finance a proper highway construction program.

In the meantime, of the elements of which the industry is composed, the vehicles themselves, both passenger cars and trucks, have been developed to extremely high capacities for performance and efficiency, and the present trend is for still greater advances in speeds, power, load capacities, etc. At the same time, the appurtenances to the motor vehicle such as fuel, tires and all the sundry materials and services necessary to its top performance, have likewise been improved in a trend paralleling the development of the vehicles. But the element of highways which these vehicles must perforce use has not kept pace with this trend for improvement and here lies the cause for the major of the ills besetting the motor vehicle transportation industry.

A Common Misunderstanding

There is one important fact often obscured in the current debates about roads. In general the country's highways are now in better physical condition than they have ever been. As a general statement it truthfully can be said, at least of the main road systems in each state, that:

(a) There are more miles of paved road.
(b) The pavements are as wide or wider than in any previous period.
(c) The surfaces are as smooth or smoother.

In other words, the present lack in capacity of our highway systems is not so much due to actual physical deterioration of the road plant as to obsolescence because the geometric features of yesterday are inadequate under the steadily increasing demands of traffic to today for service beyond the system's inherent capacities. Thus, it can truthfully be said that, for the traffic conditions for which they were built, our roads are better than ever. But maintaining these roads in such a serviceable condition has been done at the expense of considerable needed new construction, and under any amount of maintenance they still remain geometrically deficient. Because this fact is frequently overlooked, highway administrators are as frequently charged with a laxity of which they are not guilty.

A New Conception Required

In any attempt to analyze the ills affecting motor-vehicle transportation the analyst should first try to examine individually the various component services that go to make up the industry. Such an analysis has been made by Wilfred Owen in his excellent book: "Automotive Transportation Trends and Problems," in which he indicates that the difficulties confronting the industry have been basically caused by a lack of recognition on the part of motor vehicle owners in particular, and the public in general, of the fact that an owner, in making an outlay for any of the various goods and services necessary to the use of his car, in reality was purchasing not just such an individual item of goods, but actually an element of his transportation.

Of the earlier stages in the development of automotive transportation, Owen said:

> "Better and cheaper vehicles, tires, fuel and other industry products were provided simultaneously with public improvement of vast mileages of highways. Costs of transportation continued downward as the speed, comfort and reliability increased."

Now, however, the trend is different. States are finding themselves unable to finance highway improvements up to the increasing standards demanded by the vehicles which use them. Problems of congestion are increasing, not lessening, and as our roads and streets become increasingly inadequate there is a corresponding tendency for vehicle operating costs to rise. When road standards are low, transportation costs are high because of increased gasoline consumption, tire wear, accident costs, and other outlays thus made necessary.

In truth, motor-vehicle transportation is the end product of the country's greatest combination of economic activities, and the final resulting service, according to Owen:

> "involves not merely the great assembly plants manufacturing automobiles and the raw materials and parts industries which supply them, but the production of petroleum and tires, the provision of streets and highways, the financing and insurance industries, and a vast number and assortment of retail trade and service activities."

Some Obstacles to Common Agreement

Obviously of this vast enterprise it is impossible to separate any of its many component elements for individual treatment or exploitation without such action having a far reaching effect upon the whole industry. Nevertheless there are steadily increasing efforts for such individualism, and in this self-seeking is found the principal obstacles in the path of a solution of the industry's problems. One bit of evidence of this form of obstruction is found in the existence of a multitude of associations, organized on a national scope, most of whose headquarters is in the Nation's capital, from which is issued a constant stream of literature intended to influence matters concerning road legislation and research. (See Appendix).

The claims of the spokesmen for most of these organizations is that their aims are altruistic, that their operations add to the public good, and particularly benefit the motor-vehicle operator and the transportation industry. As a matter of fact, it is apparent that all but a few of them, while making such claims, actually have the primary aim of securing some special benefit or preference for themselves, or their supporters, such as the avoidance of taxes, etc., and, in many cases, the aim of self-perpetuation.

Example of Approach

Despite this situation there has still been a considerable amount of unbiased thinking and analysis of the highway problem by less slanted organizations and individuals. The upshot of most of it has been the conclusion, or what may more aptly be termed "inconclusion," expressed by the late Roy Crum, Director of the Highway Research Board, when he said:

> "To visualize the whole picture at once has already given me mental indigestion."

A rather comprehensive outline of the complexity of the highway transportation problem has been written by Richard M. Zettel, Research Economist for the Institute of Transportation and Traffic Engineering of the University of California in an article "Highway Transportation Economics" published in the August 1952 issue of "Public Roads."

Another valuable contribution of factual data is contained in the recent statement submitted by Mr. Thomas H. MacDonald to the Subcommittee on Domestic Land and Water Transportation of the Committee on Interstate and Foreign Commerce, United States Senate; later published under the title: "A Factual Discussion of Motortruck Operation, Regulation and Taxation."

The publications of the Highway Research Board are filled with similarly valuable data. Lack of space here prevents mention of the vast accumulation of unnumbered

articles presenting factual material and results of unbiased research on the subject. Many tons of paper have been covered with millions of words contributing facts, viewpoints, opinions and in many cases, special pleading; and yet no really scientific or equitable solution is in sight. About the most that has been deduced from all this available but undigested data up to now is that still more study and research is necessary before we can get the final answer.

Some Unanswered Problems

Considering the length of time in which the problems affecting the highway economics of motor-vehicle transportation have been arising it is surprising how few of them have really been solved. Considerably more progress has been made on strictly engineering problems than any other branch, although the knowledge came late for application to a vast mileage of construction. There are tremendous problems of finance and economics remaining yet of which a final solution is vital. Until they are resolved the industry will continue to operate under the present great restriction on its normal expansion.

One of the toughest and most important of the many problems so far to defy a solution acceptable to motor vehicle users and road builders alike, is that of an equitable division of the costs of furnishing highway service between the different classes of users. In fact, for this question there is not even agreement as to the theory to be applied.

Another problem of equal importance is the question as to the best method of collecting these costs.

The "Truck Problem"

The above mentioned problem of a just allocation of highway costs among the different classes of users refers to what is generally known as the "truck problem." It is only in the last few years that this problem has come to the forefront as one of the prime subjects in any discussion of highways. From a modest beginning as an insignificant proportion of the total traffic, in volume or weight, in the 1930's, heavy commercial vehicular traffic has leaped into the position today of one of the most important factors in the movement of the nation's freight. Its growth has been phenomenal and one of the most alarming characteristics of the highway picture.

For the most part, today's trucks are traveling on roads and streets originally designed and constructed for yesterday's passenger cars. Naturally the surfaces of many of these highways have failed structurally under such an unforeseen burden, and this has created one of the most controversial issues of the motor-vehicle transportation problems. Attempts at solution have consisted principally of legislation by the States aimed at limiting the loading of axles, as recommended by the American Association of State Highway Officials, a policy promulgated by the Bureau of Public Roads.

There is an understandable attitude of resistance by the trucking fraternity against restrictions which they feel are hampering the complete normal development of their industry. They rightly believe that their service has contributed immeasurably to the economic welfare of the nation through the distribution of goods to an extent that would not otherwise have been realized. This is undoubtedly true, but the question of whether the benefits thus reaped will offset the liabilities accruing because of increased congestion and higher maintenance, construction and reconstruction costs of the highways is still unresolved.

The trucking industry, to the extent that is represented by its national organizations, expresses itself as being not only aware of the seriousness of its dilemma, but willing to contribute to the proven increased cost of highways in a measure scientifically determined as equitable. The application of axle weight limitations receives heavy opposition from the truckers, and large groups of them are constantly working to obtain legislation for increased axle weight allowance and, to nearly as great a degree, a reduction in license fees; an attitude somewhat contrary to the expressions of their national representatives.

What should be done in this matter is to continue the research that already has begun toward a solution of the problem, with an effort to conclude it promptly as is possible, to the end of correlating the costs of vehicular operation under varying loads with the cost of constructing and maintaining roads for such loads in order to determine the point of economy—the lowest combined total per ton mile of transportation. This determination should be made the basis of an equitable and acceptable tax rate.

In the meantime it is suggested that a period of moratorium be adopted on questions of truck weights until they can be settled on the basis of facts determined by research.

Is There An "Easy" Solution?

With all the misconceptions that prevail about our highways, and considering the tremendous difficulties that must be overcome to achieve an equitable solution, the majority of those who are interested but are not familiar with the actualities of the situation may well ask: Is there any formula that will afford quick relief? The answer is NO. There is no wizardry that can produce highways overnight, and without the burden of necessary cost. This does not mean, however, that the country must necessarily continue indefinitely in the muddle caused by its own misthinking.

A New Conception Needed

Highway administrators believe the answers to their problems should begin to be obvious to the vehicle owner when he learns to think, as he should, in terms of *total* costs of his transportation; and that if he does this, he will come to realize that of every dollar he has to spend for automotive travel, a larger proportion should be spent for the element of highways in order to achieve the logical economic balance with the other elements of cost and thus secure the lower total costs which should be the ultimate goal of the industry.

This is one conception which must prevail before any equitable solution is possible; the road user rather than pleading for special treatment favoring of his own immediate personal interest, such as an immediate reduction in his user tax, should take a larger view and begin to analyze the problems of motor-vehicle transportation as a whole integral industry. Only by this attitude can he halt the influences that now are interfering with the full potentiality for service and hindering the nation's economy.

Clear thinking, and the application of sound economic principles must be substituted for the prevalent wrong thinking and the search for illusory panaceas.

People Must Be Acquainted With the Facts

One of the preliminary requisites most important to an intelligent attack upon the highway problem is a unanimity of opinion by the people. The general public must be brought to a realization of the seriousness of the situation and of the necessity for a solution, or the eventual conse-

quences of indifference. For this reason the first step toward the solution, and the one upon which the success of all future steps will depend, is the accomplishment of an awakening of the public to the realities of the highway crisis. The people must be made aware of the facts. This having been done, a popular demand for definitive action will certainly follow, and a genuinely united demand for action will not suffer resistance.

Undoubtedly the best promotion agency for this job of education would be the joint effort toward this single purpose by all the many and various trade and other organizations whose primary interest is in some component element of motor-vehicle transportation. They should be asked to forego their individual aims and efforts until such time as this bigger and more essential job is accomplished. The ends thus jointly obtained would eventually be to their individual advantage for subsequent exploitation.

A beginning has to be made, so it is suggested that the associated organizations of the motor-vehicle manufacturers be the first to pick up the ball in an effort to persuade the other organizations existing for the purpose of influencing thought on motor-vehicle transportation to join with them in one big centralized joint council, formed for the specific purpose of acquainting the public with the intolerable highway situation, one thing upon which most of these organizations agree.

Beyond doubt such an effort, by enlisting the aid of all the nation-wide networks of available sales and service agencies and other organizations that could be thus subsidized, would be crowned with unquestionable success. It probably would involve the directed efforts of most of the one in seven persons of our population who gain their livelihood from motor-vehicle transportation. How could such a united undertaking fail of success? If a fervor for adequate highways could be induced to equal that which existed in the 1920's when the legislation and other moves toward the acquisition of good roads were "whooped" through with practically no opposition, then today's task will be a long way toward the desired goal.

Some Basic Facts

Another preliminary requisite to a successful conclusion is a recognition by all concerned that, in considering the problem of how to pay for an adequate program of highway construction, there are two hard, inevitable facts of finance that must be incorporated in the analysis:

(1) Highway construction costs today are more than double what they were a decade ago. The situation is, of course, the same as that found in all other industries affected by the inflationary trends of the times, as it is reflected in the costs of the other elements of motor-vehicle transportation—the vehicle, fuel, services, etc.

(2) The people will ultimately have to pay the cost of any highway program. No matter through what agency the work is financed, the inevitable process of tax incidence will shift the burden along until eventually it comes to rest upon those who buy goods and services made available by highway transportation. There is no magic formula that will prevent this working of economic law.

Despite this inevitable shifting, however, the tax burden necessary should originally be laid immediately upon those whose benefit is primary—the highway users.

Not One, But Many Problems

Yet another necessary correction to the present trend of opinion is to obtain recognition of the fact that the problem of constructing and financing adequate highways is not solely one big nation-wide headache capable of remedy by a single huge prescription, but a combination of 48 individual headaches requiring in part, at least, a separate course of treatment for each. This is principally caused by variations in the constructional provisions of the individual states, as well as by variations in the financial situation and abilities of each, or perhaps some other peculiarity. For these reasons, then, the design of an attack upon highway problems must, in greater or less degree, be modified for application to each state.

Federal Influence

One of the major decisions which should be made preliminary to, and part of, a concerted attack is a determination of the future policy of the Federal Government's interest in highway construction; whether to continue, as at present, a policy of Federal aid to the States requiring matching of funds, or whether some alternative system of participation in highways is warranted in view of the present circumstances. There are some who believe all Federal aid to states for any purpose is unwarranted, but surely no one can gainsay that Federal aid for highways has been of inestimable value in the past by having stimulated highway construction in areas where action would have been extremely slow but for the government advocacy. In the pioneering stages of highway promotion there is no doubt as to the benefits of Federal aid. The influence of the Federal government in setting up progressive engineering and construction standards has been entirely good, and the Federal agencies have pioneered in the field of highway research, where its leadership has been of incalculable benefit.

Federal Interstate System

One of the more forward looking actions by the Federal government was contained in the Federal-Aid Highway Act of 1944, requiring the designation of a National system of interstate highways, not to exceed 40,000 miles, which would unite the systems of the states by a network of those highways chosen for their particular interest to national transportation for commerce and defense. This system consists at present of 37,681 miles of the nation's principal highways connecting the principal metropolitan areas. Two thousand, eight hundred and eighty-two miles of the systems are in urban areas, the rest in rural. The system comprises 1.1 per cent of all rural roads but carries approximately 20 per cent of all rural traffic. The designation of the system has received almost unanimous approval by the States.

Of considerable less popularity in many states, however, was the action by the Federal Government initiating Federal aid for secondary roads, which step was felt, by many state governments, to be an intrusion into fields which should remain under purely local control. The consensus has been that the increase of Federal grants for this purpose could better have been given to the more important traffic carriers, the Primary systems, rural and urban, with a resulting greater aid to transportation.

Federal Taxation

Another element which has adversely colored the picture of Federal aid to highways is in the field of taxation. When Federal aid was first initiated there was no Federal tax on motor fuel, which since 1919 had been developed as a source of income for, and considered a prerogative of, the states,

who exploited the field from the beginning for the benefit of highways. Since then some states have broadened the use of the fuel tax to cover other governmental purposes, but in the main fuel taxes have been considered by both, the states and the highway users, to be a highway use tax which should be dedicated to highway purposes. In many states its diversion to other purposes has been constitutionally prohibited, and there is a continuing effort, with some promise of success, to extend this prohibition to others.

When the Federal government first instituted its fuel tax in 1932, it was a moderate amount in an effort to tap a source of income for emergency purposes. Although it was a glaring example of double taxation the claim was made, when the Federal tax was initiated, that the total amount of Federal aid to highways exceeded somewhat the collections from the tax. The argument was often advanced that the tax acted somewhat as an "equalizer" of the disparity between the financial ability of States, whereby the income in the few of the richer states, where the collections exceeded the Federal Aid allotment, was distributed to the many states where the collections were less than the allotment.

This argument may have pleased those States that thus benefited, but as the Federal tax grew, both in rate and total collections, the picture changed. It is presently apparent that the collections of the Federal tax now exceeds the allotment of Federal aid for highways in all but a few of the states, and the total collections is considerably more than the total Federal aid.

There is a strong feeling that the fuel tax, either as collected by the States, or the Federal government, should be considered as dedicated to highway purposes, particularly in view of the present highway deficiencies. The question is asked: Why should the road system suffer from a diversion of a type of tax which only their very existence made possible?

There are many other Federal taxes which, along with similar taxes laid by the states, are placed directly upon the highway user. It has been reliably estimated that taxes amount to an average of 29 cents out of every dollar a buyer spends for a new car. Some of this amount is not caused by duplicate taxes, and some may be warranted, such as a property or income tax on the dealer or owner, but in the main in addition to his ordinary share of taxation, the road user seems to have been singled out to carry an unfair share of the general tax burden which is not returned to him as an element of his transportation. Generally the State taxes him under the "benefit" theory, and the Federal government lays a duplicate tax on the "ability-to-pay" theory, or, more truthfully on the "ease of collection theory."

The effect of all these taxes is to penalize and discourage motor-vehicle transportation, especially the element of highway construction, at a time when it should be encouraged. What to do about them is a moot question. Those of which the reason for being lies solely in their productiveness and in the ease of their collection, and not in any theory of benefits or privilege, should be laid elsewhere or returned in services which directly benefit the class upon whom they are assessed. This is a good argument for increased Federal aid.

Federal Aid Policies

From the foregoing it is obvious that the present policy of Federal aid is not sufficient or sound, when, of Federal taxes on the highway users amounting to a total of approximately 1 billion 600 million dollars annually, only 500 million are returned as aid to highways, and then on condition of a like amount from the States. There are several alternate policies which would be more equitable:

(1) Federal aid should be increased to an amount which would at least equal the amount collected by the government from fuel and other taxes paid by road users. This is the minimum equitable policy.

(2) The Federal government should take over responsibility for construction of the Interstate system. The fuel tax collections alone amounting to 550 million dollars annually (and expected to increase each year as it has in the past) would readily amortize the 11 billion dollars required for this purpose.

(3) The Federal government should abandon the field of taxation on motor vehicle users, or at least motor fuel taxes, thus permitting the States to increase their taxes by a like amount. The resulting increased income to the States should, of course, be dedicated to highway purposes.

(4) As the best service it could render to highway construction the Federal government should:

(a) Abandon the field of taxation as suggested in (3) above, and also

(b) take over the responsibility for construction of the Interstate system as suggested in (2) above.

This latter policy is particularly warranted at this time when it appears that spending for defense purposes has reached its maximum, and is expected to begin to decline in the future. The policy would provide a cushioning effect for the economic disruptions certain to follow a decreased Federal defense spending program unless the reduction is made gradually.

Some General Suggestions

Nothing created by man is permanent. Along with all the other things which man uses for his everyday requirements of existence and pleasures, his roads wear out, and must be replaced to maintain a continuance of their utility.

Road life studies are available which indicate the probabilities of the necessity for future road surface replacements, and these reveal that within a ten year period about 44 per cent of the nation's existing high-type road surfaces will be ready for retirement; about 74 per cent of the intermediate type surfaces and about 94 per cent of the low type surfaces also will be worn out.

To prepare for this eventuality and provide for a continuance of service from highways for motor-vehicle transportation requires that careful studies must be made by the individual States to provide a program and determine a sound method of financing replacements and necessary expansions. Undoubtedly such a program will call for increased user taxes, which in the early stages, most likely and logically will be in the form of additional fuel taxes. This probability requires that there should be made an investigation into the effect of the total cost of fuel, including the tax, to avoid the possibility of a total cost per gallon that will cause a resistance to its use and a diminishing return. To achieve this study means that the petroleum interests, as one of these now advocating an absolute policy of no further fuel taxes, must cooperate rather than continue a policy of continuing a resistance not factual or based on sound economics.

With the answer to the question determined, taxes may be laid in an amount which, added to the other costs of fuel,

will total less than the determined critical cost. It is here assumed that this cost has not been reached in any State, considering as proof the demonstrated willingness of users to pay increased costs of other necessities for motor-vehicle travel. As an example, the willingness of motorists to pay toll charges which are the equivalent of a tax of 15 cents or more per gallon of fuel would indicate that the maximum critical tax rate on fuel has not yet been even approached.

Needs Studies

Each state should determine its own needs based upon an engineering-economic study of all the public highways and streets which form a part of its transportation system. Several such studies have been made recently; they should be made in every state.

An assessment of the condition of each section, of each classification of highway should be made; along with an estimate of the total cost necessary to bring the whole system up to adequate standards. A program of construction should then be laid out to achieve these standards in as short time as is consistent with the State's possible financial ability. The plan should take into account standards of tolerability, and be based upon an intelligently arrived at estimate of each highway section's sufficiency upon which to base priority of construction.

Financial Considerations: Pay-As-You-Go vs. Borrowing

With a plan of construction and its estimated cost determined by each state, then the tax rate may be set which will accomplish the program. Payment for the program could be done by several different methods. Where a 10, 15, or 20 year program will accomplish the adopted plan without undue restrictions on road use, then the so-called "pay as you go" plan may be chosen by which current work would be paid for out of current income.

The term, "pay as you go," has a false connotation. The "pay as you go" plan is in reality a "pay before you go" arrangement, since the cash is collected before the facility is made available. The principal, and probably the only, virtue of this method is the avoidance of interest charges. Whether this could counterbalance the necessity for highway users waiting for the facilities is a debatable question.

A much preferable financial arrangement generally is that of borrowing the money necessary for the program through the issuance of State Bonds, of which the interest and repayment of principal would be made out of future taxes on the highway user. Thus the accomplishment of the plan would be realized much sooner than by the co-called "pay as you go" method, and in fact, payment would be made by the current users of the highways, a true pay-as-you-go. Other advantages such as elimination of higher maintenance costs for the replaced facilities, would accrue to this method.

One of the principal advantages of the bond issue method is that the tax rates, methods of collections, and the basis of their allocation among the user classes can be changed as found equitable from current research, thus correcting inequities as they are discovered without endangering the future of the program.

Gas Taxes and Motor-Vehicle License Fees

With an equitable basis determined for distribution of highway costs among the various user classes, then the amount and method of collecting these costs must be chosen. This requires that a comprehensive motor-vehicle use study be made, so that a license fee may be set for each vehicle of each class of user that will equalize the receipts from the fuel tax received from each class, and make the total of the fuel tax and fee equal that class's responsibility. Once such a study has been made it should be kept posted to reflect current conditions so that changes can be made in license fees as frequently as may be required to assure the continuance of an equitable distribution of the burden.

Too frequently license fees have been established as the result of compromise, or comparison of a schedule with those of other states, rather than on engineering economics based on factual information.

Toll Financing

In recent years there has been a trend toward the financing of roads by bonds repaid from toll charges. Apparently those toll roads already in operation are successful ventures as far as they are individually concerned, but the current tendency to apply this method of finance is fraught with danger. Ultimate justification for toll roads will only come if the estimates of income made in advance are found to be accurate and if they fit in well as a supplement to the free systems without endangering the free highways usefulness. Toll road financing is only warranted where traffic is heavy and trips comparatively long. They are of no value to the shorter trips that will remain to use the free competitive road. As has been stated elsewhere, the toll charges of about 1 cent per mile approximates an extra fuel tax of about 15 cents per gallon, and if this amount were collected for free roads of equal usefulness, they could be readily financed thereby without the extra cost of the higher interest charges and administration.

What Will It Cost?

The most recent estimate of costs (1951) of improvements needed on the Federal-Aid highway systems in the United States is as follows, in approximate figures: (taken from testimony presented to the U. S. Senate hearings on highways, 1951, by B. D. Tallamy, President of the American Association of State Highway Officials).

Federal Aid Primary System	$15,266,235,000
Federal Aid Secondary System	8,458,900,000
Federal Aid Urban System	8,282,110,000
Total	$32,007,245,000

Of this amount, approximately $11,000,000,000 is for the Interstate System.

For the part of these systems which lie in West Virginia, the cost was estimated as follows:

Federal Aid Primary System	$ 453,831,000
Federal Aid Secondary System	516,682,000
Federal Aid Urban System	201,820,000
Total	$1,172,333,000

Of this amount, approximately $140,913,000 is for the Interstate System. Of the total of the FAS estimate, $293,-310,000, or about 57 per cent, is for roads on the State Secondary System, leaving $223,370,000, or about 43 per cent of the FAS, for roads on the State Primary system.

Assuming that the Federal Government take over the full responsibility for construction of the Insterstate System in West Virginia, the remainder of the estimated cost allocable as the joint responsibility of the State and Federal Government is found to be $1,046,126,000. Of this amount $752,816,000 is on the State Primary and $293,816,000 is on the State Secondary.

Is this too great a burden for the State to carry alone? The answer, of course, remains to be determined in the light of a detailed study and analysis as recommended hereafter. In the first place, the estimates of cost were made on the basis of the application of the A.A.S.H.O. standards, as contained in its published policies, for double the present traffic in all cases. Naturally, a doubling of the traffic on many of these sections, especially of the Secondary system, is not to be expected for at least 20 years.

Based on a 10 year program for the entire outlay, we find that the average annual expenditure necessary to accomplish that part of the program consisting of the State's primary system; less the estimate for the sections on the Interstate system, amounts to approximately $69,000,000 annually. To include that part of the Secondary system which is on the FAS, the total annual outlay necessary over a 10 year period is found to be approximately $100,000,000.

A measurement of the sufficiency of the highways must be made to determine the degree of necessity for construction and priorities, from which it is probable that the necessities for a 10 year program of construction could be shown to require about half of the above amounts annually; about 35,000,000 per year for the Primary system alone, or 50,000,000 per year to include the Secondary system.

If the Federal government should relinquish the field of gasoline tax, it is fairly obvious that the State, by levying an additional tax on fuel, and with an "across-the-board" increase of licenses (pending the results of a scientific study of license fees), could carry this burden handily by an issue of bonds.

The details of terms, interest and coverage are beyond the scope of the present discussion. It is probable that a similar situation may be found in each of the other states. It is not proposed that the initial tax or method be considered the final answer. Rather the subject of taxation on motor vehicles should be kept in a constant state of inquiry as to the warrant under current circumstances, and continuing research.

Research

There is a tremendous lack of factual data concerning the highway problem, particularly in the realm of traffic operations, economics, finance and administration. At present practically the entire burden of highway research is carried on by a few organizations, principally the Highway Research Board and the Bureau of Public Roads. Most of the field work for research is done by committee members whose principal job is in the field of practice rather than research; so the research gets only what time and effort is left over from that necessary for the "bread-and-butter" jobs.

Research should be undertaken and carried through to the conclusion by men especially assigned to the work as a full time occupation. More highway research is needed, and to get it done promptly and expeditiously, all highway administrative organizations must devote a greater part of their funds to the purpose.

Engineering and Construction Capacity

At present there is a shortage of adequately trained highway engineers. In view of this, and considering the possibility that most contractors are presently engaged in construction work for defense, there is doubt that a suddenly accelerated highway construction program could be efficiently handled. Temporary shortages of equipment and materials may also act as a deterrent.

These shortages probably will make it necessary that a highway program be initiated gradually rather than suddenly. If the hope of some economists that Federal defense spending is due for a reduction in the near future, then the highway program will be most timely and furnish a cushion, by absorbing the engineering and construction capacity now engaged in defense work; an ideal situation. Otherwise the highway program will have to be fitted in with the Federal expenditures for other purposes as best it can be, with extreme care being taken that the program does not cause another spiraling round of inflationary cost increases that will defeat the program.

Making the Best of What You Have

Regardless of whether or what action is initiated to secure the adequate highways we need, there is one step that should be taken under any circumstances, that is, to secure the best possible efficiency from the highways and streets as they presently exist. It is the poorest kind of judgment to permit bad practices of parking, unwarranted traffic movements, and other traffic evils to reduce the traffic carrying capacity of our highways to anything less than the maximum obtainable. Even the most modern facilities imaginable can be neutralized into bottlenecks by a lack of proper traffic control, and conversely, there are many so-called bottlenecks that could be made considerably more efficient than at present if only they were properly organized by the application of traffic engineering principles.

The remedy lies in the hands of competent traffic engineers if they be given the task to do without hampering restrictions. This should be done immediately in every state, city and town where such action has not already been taken. It is probable that there will be found more returns in the way of added traffic capacity per dollar of investment in competent traffic engineering than from any other investment that could be made.

Summary

Obviously, it is beyond the scope of such a paper as this, as well as impossible within the time limits set for its submission, to analyze the highway problems of 48 states, much less suggest a unique method of attack aimed at their solution. There are, of course, some general rules, or steps of procedure, that may be found capable of universal use. Some of these will here be suggested, although in many states some of them, or some adequate alternate of equal effectiveness, may already have been adopted.

It is intended here, therefore, to suggest first those moves or policies which should be used or followed in a national scope of action, and follow those with specific suggestions which may be applicable to the problems of West Virginia. Whether these latter may fit into the scheme of another state's solution is subject to the limitations above mentioned, but no doubt the basic principle may be applied if appropriately modified. It is felt that these suggestions are sound, being based upon tried and accepted principles of economics.

The action required is presented somewhat in the chronological order of its proposed application although each step should not be taken as a completely independent move. Whether any individual suggestion is capable of nationwide acceptance, or of only individual state acceptance, is not indicated for every suggestion, but each suggestion's capability should be readily recognized under the circumstances existing. The plan follows:

Plan of Action

(1) Obtain public recognition of the highway problem, as outlined under heading: "People Must Be Acquainted With The Facts."

(2) Initiate immediately a full scale comprehensive program of highway research, with the participation of all governmental highway agencies, Federal, State and local with particular emphasis upon determining:

(a) The cost of furnishing highway service to the various classes of vehicles.

(b) The relative costs of operation of these vehicles by classes.

(c) The balance between the operation costs at various vehicle weights and the correspondingly necessary costs of furnishing the highway in order to ascertain the necessary limitations in vehicle and highways that will make the least total combined cost. (See under headings: "Some Unanswered Problems" and "The Truck Problem."

(3) Obtain Federal Legislation that will:

(a) Create a new Federal Highway organization higher in the echelon of national affairs, and with greater power and authority than the present Bureau of Public Roads.

(b) Abandon the Federal gas tax so that the states may use this additional taxing power. (See under heading "Federal Aid Policies.")

(4) Adopt a policy of Federal expenditures which will permit the Federal government to:

(a) Proceed promptly with a ten year plan for the construction of the Interstate system, through its own planning and contracting organization, or by 100 per cent grants to the States with proper Federal supervision.

(b) Establish Federal-aid to States for the construction of the F. A. System on a matching basis in an amount at least equal to the total income from imposts on motor vehicles and appurtenances, which amounted to more than 1 billion dollars in 1950.

(5) Make it a requisite that Federal aid will be granted for construction only where such work is shown to be warranted economically and where priority has been established by a comparative traffic survey or by a sufficiency rating.

(6) Require of each State:

(a) An up to date road use survey of its highways.

(b) A classification of all highways into systems based upon functions, traffic usage and importance, with the establishment of minimum standards for widths, control of access both roadside and intersectional, capacities, right of way, etc. with appropriate provisions for future expansion.

(c) A survey of each system, dividing each highway into proper control sections and the determination of a numerical sufficiency rating for each rural section, and a priority based upon an engineering-economic study for each urban section.

(d) A complete financial survey and report of the present over-all financial status and bonded indebtedness for roads and all other purposes, taxes and expenditures by purposes.

(7) Having obtained the public support as outlined in (1) above and with the factual data at hand as outlined in (6) above, by and through a continuance of the promotion work, persuade each state, as between it and the individual interests involved, to declare a moratorium on all legislative efforts to change the present limitation on loads, dimensions, speeds, etc., until such time as a scientific basis for action may become universally recognized as a result of the research recommended in (2) above.

(8) After the accomplishment of (6) above, work for appropriate State legislation that will establish a scale of motor vehicle fees and taxes for the different classes of vehicles that will equitably allocate the burden of financial responsibility among them. At the same time revise the fuel tax to the amount of maximum returns. Make an engineering-economic estimate of total probable annual returns from these sources to cover a 10 year period in the future.

Promote the passage of legislation, either State, Federal, or both, that will prohibit the use of license fee taxes on motor vehicles, or tax based on the gallonage of motor fuel used, or taxes on lubricating oil, for any purpose except the maintenance or construction of highway facilities.

(9) On the basis of the above estimate of returns, determine the total amount of bonds justified, considering deductions for current administrative, maintenance and other necessary expenses.

(10) Lay out a program of annual construction that may be accomplished within the bonding limit as in (9) above, covering a 10 year period to include those highway sections with the lowest priority ratings (determined as in 6-c above), thus arriving at a tolerability rating; this rating of tolerability to be reviewed each year as construction progresses and changed as may be permitted by the amount of money available for each year's program.

(11) Proceed with the program as rapidly as possible under the limitations of:

(a) Ability to make plans

(b) Ability to supervise construction

(c) Availability of contractors

(d) Ability to sell bonds at an economical interest rate

The overall program should be reviewed and revised at least annually to conform to such economic changes as may occur.

Conclusion

Can we afford it? A better question would be: can we afford not to have it?

Could we afford not to have the present rate of spending for national security? Can a country which has subsidized railroads by huge land grants, which subsidizes air transport, which builds huge dams to develop low cost power to sell to its citizens, which protects cities with floodwalls and conservation dams, which supports farm prices, which talks of increased social security, which talks of cradle to the grave medical aid, which seriously contemplates financial aid to the states for education, which subsidizes housing through many different channels; and in short, which apparently aims its every effort to supply its citizens with what it thinks

they should have; can such a country neglect to supply its citizens with the most primary necessity of all—the means of transportation?

Transportation will decide our future—whether the material and social progress of the past should continue to push to new frontiers of realization, or whether we shall stagnate because of an increasing lack of paths for commerce. During the past decades automotive transportation has grown from a relatively unimpressive experiment to one of the most important elements of our national economy, and the decisions to be made affecting this segment of industry will indicate the path of our future.

The time of decision is here and now. Already there is evident an increasing strangulation of automotive transportation due to the lack of adequate highways that, if continued much longer, will jeopardize the very life of the nation. If the provision of the improved routes necessary for automotive transportation is permitted to keep pace with the trends of the past 30 years (except for the immediate past) then our nation will continue to thrive. But if the influences which have been causing the inadequacy of highways during the last few years be allowed to prevail much longer, then the outlook is dark indeed.

Appendix No. 1

Partial list of national organizations having a primary interest in influencing some element of motor vehicle transportation:

American Association of Motor Vehicle Administrators
American Association of State Highway Officials
American Automobile Association
American Concrete Institute
American Concrete Pipe Association
American Farm Bureau Association
American Iron and Steel Institute
American Municipal Association
American Petroleum Institute
American Public Works Association
American Road Builders Association
American Society of Planning Officials
American Society for Testing Materials
American Transit Association
American Trucking Association, Inc.
Asphalt Institute
Associated Casualty and Surety Underwriters
Associated General Contractors of America
Association of American Railroads
Automobiles Manufacturers Association
Automotive Safety Foundation
Automotive Trade Association Managers
Bureau of Public Roads
Calcium Chloride Association
Chamber of Commerce of the United States
Eno Foundation for Highway Traffic Control
Highway Conservation League
Highway Research Board
Illuminating Engineering Society
Institute of Traffic Engineers
Institute of Transportation and Traffic Engineering—University of California
Inter-Industry Highway Safety Committee
International Roads Federation
National Association of County Officials
National Association of Motor Bus Operators
National Automobile Dealers Association
National Auto Wreckers Association
National Committee for Traffic Safety
National Committee on Uniform Traffic Laws and Ordinances
National Congress of Petroleum Retailers
National Conservation Bureau
National Council of Private Truck Owners, Inc.
National Crushed Stone Association
National Highway Users Conference, Inc.
National Industrial Traffic League
National PAR Committee
National Ready Mixed Concrete Association
National Safety Council
National Sand and Gravel Association
National Slag Association
National Tank Truck Carriers, Inc.
National Gasoline Supply Men's Association
National Truck Tank and Trailer Tank Institute
National Used Car Dealers Association
North American Gasoline Tax Conference
Portland Cement Association
President's Highway Safety Conference
Rail Steel Bar Association
Society of Automotive Engineers
Street and Traffic Safety Lighting Bureau
Trailer Coach Manufacturers Association
Truck Trailers Manufacturers Association
Wire Reinforcement Institute
Yale Bureau of Highway Traffic

Appendix No. 2

Selected Bibliography

AASHO Policies on Design Standards
American Association of State Highway Officials

Effect of Gasoline Tax Increases on Gasoline Consumption
Ohio State Department of Highways

Financing a Nation-Wide Highway Program
R. E. Jorgensen

Gasoline Taxes, Automobile Operating Costs, and Highway Costs
E. M. Cope and L. L. Liston, Bureau of Public Roads

Highway Design and Construction
Bruce and Clarkson

Highway Economics
Tucker and Leager

Highway Facts
Automotive Safety Foundation

Highways in the United States
U. S. Department of Commerce, Bureau of Public Roads

Highways in Our National Life
Princeton University—Bureau of Urban Research

Highway Statistics, Summary to 1945
U. S. Department of Commerce, Bureau of Public Roads

Highway Statistics
1946
1947
1948
1949
1950
U. S. Department of Commerce, Bureau of Public Roads

Interregional Highways
Message from the President to 78th Congress of the United States

Making the Best of Today's Streets
Chamber of Commerce of the United States

Motor Fuel Taxation in the United States
Finla G. Crawford

Public Aids to Motor Transportation
Volume IV, Federated Coordinator of Transportation (Eastman Report)

Recent Trends in Highway Bond Financing
H. C. Duzan, W. R. McCallum and T. R. Todd

Highway Research Bond, Proceedings 1952

Roads Without Gates
By John V. Lawrence, West Virginia Transporter, November, 1952

Taxing Washington's Motor Vehicles Equitable for Highway Services
Dr. James C. Nelson

The Ohio Incremental Study and Experiment in Motor Vehicle Tax Allocation
D. F. Pancoast, Paper presented at 32nd Annual Meeting of the Highway Research Board

Theory and Practice of Highway Improvement and Utilization in the United States of America
Bureau of Public Roads

Traffic Engineering Handbook
Institute of Traffic Engineers

Ancient Street Patterns

By Taylor D. Lewis (Mem., ITE)

Operations Analyst, Operations Research Office, John Hopkins University, Chevy Chase, Maryland. (On leave from Cornell University)

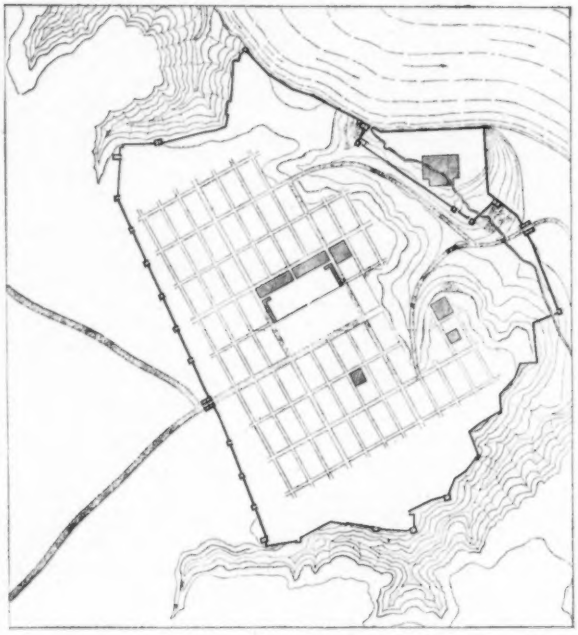
CITY PLANNING and the lack of city planning as practiced by the ancients shows similarity to that practiced today. In one city planning category, involving patterns of street layout, the similarity is marked. The basic needs of the people have remained much the same down through the years, therefore great surprise should not be evidenced at these agreements between the ancients and the moderns. Granted that the "tempo of life" has increased; that the emphasis of our towns has shifted from agriculture to commerce and trade; that with the advent of the automobile our streets must be widened; and that we have a few examples of metropolitan concentrations of population which exceeds those of the ancients; still our city street patterns are similar in shape if not in scale. The urge to sort out the works of past generations until parallels are established is at times irresistible but this does not alter the fact that our latest sub-division plats often look like something planned by Hippodamus of Miletus in 440 B.C.

Unfortunately, the historians and the archeologists have produced for inspection relatively few good examples of complete early city plans. Therefore, the question is always present, are the known examples typical? Also, the amount of available data concerning these few city plans seldom reaches the amount which would satisfy the investigator. Even such an item as street widths, which most anyone would suppose are simple to obtain, is in fact very difficult to obtain both in the field and from the published reports.

In classifying ancient city plans it is common practice to divide the plans into two main groups with several subgroupings. The first group would contain those plans where there is no evidence of "planning" and the second group would contain the city plans which could qualify as showing evidence of "planning." There may be city plans which could fit into one or the other of the groups but for reasons of insufficient data may not be assigned definitely to either. In addition, due to development during several periods, parts of the same town may fall into separate categories.

We must define "planning" in order to divide intelligently our city plans into either of these two main categories. It is reasonable to assume that when an ancient planner laid out a street in a straight line, rather than following a meandering foot or cart track, that he used a planning technique. If his street was of uniform width throughout its course, we assume that the evidence of planning is strong. Intersecting streets uniformly spaced and intersecting at right angles will, to be sure, definitely place a plan in the "planned" group.

Ancient town planners seldom used angles other than the right angle for street intersections. This probably was because other angles were difficult to reproduce with the crude surveying methods available. In fact, they had difficulty in consistently reproducing the right angle. The exception to this generally may be found in the plan of Rhodes in Egypt. This town was laid out in a "fan" shape in 408 B.C. and was a distinct departure from the usual Hippodamium plan of the day for new towns.



From "Excavations at Dura-Europos"—Yale University Press

Fig. 1
Plan of Dura-Europos.

Another exception to the straight street rule possibly may be found in ancient city planning in warm or hot climates. Narrow, crooked streets in these climates were in favor because they prevented the sun from warming the walls of the houses and shops. Arcades could and did serve the same purpose in these climates but involved considerable labor and expense plus the fact that stone was not available at all sites. Mud brick, which was often the only building material found on the site of cities built on the flood plains of the great rivers of history (Indus, Tigres, Euphrates and Nile), did not lend itself easily to the construction of arcades.

Mention of the fact that narrow crooked streets are more easily defended than wide straight streets can not be avoided. There may be a slight possibility that some ancient city planners took this fact into account and deliberately planned winding streets.

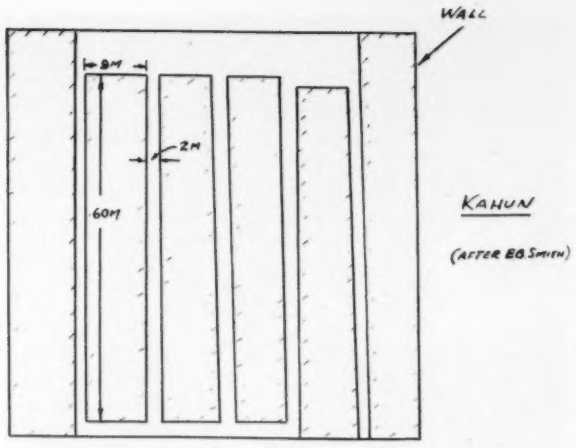


Fig. 2

There is considerable difficulty experienced, especially by the non professional archeologist, in an attempt to fix dates for city plans or periods of typical planning. Various areas of the world developed at different rates. Therefore a specific date assigned to a development age for one area will not be significant for other areas. The descriptive systems of dates based on tools used by man (stone, bronze, iron, etc.) and on civilizations (Hellenic, Hellenistic, Roman, etc.) also seem to be unsatisfactory. Therefore, an attempt will be made, in this paper, to classify town plans according to the degree of planning evidenced with frequent lapses into chronological dates and civilization periods.

A town which slowly grows from a small nucleus has very little chance to develop according to a definite plan as compared with a town which is completely established in a short time. Even the town which has been established according to plan will, as it grows, develop at variance to that plan. Variances may not only interrupt the alignment of streets and the extension of the general pattern but may mask the original town plan by encroachments on both the streets and the planned open spaces. It is only with difficulty that the original plan can be recognized in many instances. The best examples of early planning are found under two conditions (a) the entire city or town developed as a new town during a short period of time and (b) some disaster overcame the town so that no additional growth or alterations were possible.

A very powerful force must be exerted in order to replan an established town. Vested interests resist change and this fact was just as true in ancient times as it is today. Disorder and an unorganized street system does not become intolerable in a town until that town has grown to fair size, then the resistance to change usually exceeds the force necessary to accomplish a redevelopment. With these conditions well in mind, it is not difficult to see why fairly large cities existed and prospered despite their lack of city planning, not because the people were ignorant of city planning technique but because of resistance to change. The "planned" city and the "grown" city existed side by side in historical time and space.

Town and city very early beginnings are usually considered as groupings of the huts of a tribe around that of the chief. The area of the town was small and the street system unorganized but simple. Within the village, open spaces were not necessary because it was but a step to the edge of town. The population was small and the people lived a semi-nomadic existence. Such communities existed ten to twelve thousand years ago as proved by remains discovered in various parts of Europe. Examples of these villages have been found on the beaches of the Baltic Sea in Denmark dating from 6,000 B.C. Quite a few villages were established around the lake shores in Switzerland, some of which were occupied from 5,000 B.C. to historic times. Pre-Roman, iron age, stockaded islands or lake shallows, the remains of which are numerous in Ireland and Scotland, also belong in this group of pre-historic villages.

The next classification of towns is difficult to define since it is simply an enlargement of the older unorganized town. This type of town may have had crude processional ways or perhaps poorly organized open spaces both emphasizing a temple or the like. They were usually fortified and most always crowded. Athens and Sparta could qualify for this group since they both just grew with little or no city plan. Athens, for example, had narrow, tortuous, unpaved streets which served as open sewers. In contrast to the lack of organization of Athens is the planned town of Piraeus, the harbor town of Athens. The people in both Athens and Sparta built magnificent public buildings but lived in squalor.

In warm climates in areas where the ground was fertile and crops could be grown without too much effort, larger communities developed. Agriculture was the main occupation but trade was established. The early towns of this era are identified with their processional-ways. These main streets usually were fairly straight, or had straight sections, and led from a gate in the wall to an important building or temple. The width of the processional-way was variable throughout its length. Some of these main streets were paved, even arcaded, and some had provisions for drainage and sewers. Mohenjo-Daro, Ur, Opis, and Babylon are all good examples of the larger towns of this period. It is interesting to note that Seleucia was founded sixty miles north of Babylon next to Opis by Alexander's great general Seleucus Nicator in about 319 B.C. and eventually absorbed both Opis and Babylon. Could it have been that Seleucia prospered (population 600,000 in 77 A.D.) because of its regular city plan?

During an unidentifiable period, the emphasis was shifted from the processional-way to the market place or agora in these early towns. The street system was unorganized and the more important streets connected the agora radially to the gates in the wall. Prior to 7th or 6th century B.C. towns in Greece or Asia-Minor had few fixed features except the Agora.

It was not too long before a street system of two main straight streets crossing at right angles developed. These cross streets were at first subordinate to the agora but later the agora was abandoned. With the passing of the agora, the main streets took over the functions of the market place. Temples, public and semi-public buildings, shops, and markets lined the major streets where before they fronted on the agora. Priene, although rebuilt in the Alexandrian period, is a good example of a town plan with the main emphasis on the agora. There is one main (E. & W.) street from the gate to the north side of the agora and one wider than average (N. & S.) street which leads to the agora center. Dura-Europos (Fig. 1) shows evidence of a combination of emphasis on the agora and the intersection of two main streets.

Town plans built around the intersection of two main streets are numerous. The oldest of these seem to date to at least the 7th century B.C. but there is also something decidedly Roman about this plan. Therefore, there may be cases of replanning which confuse the issue. Certainly it is reason-

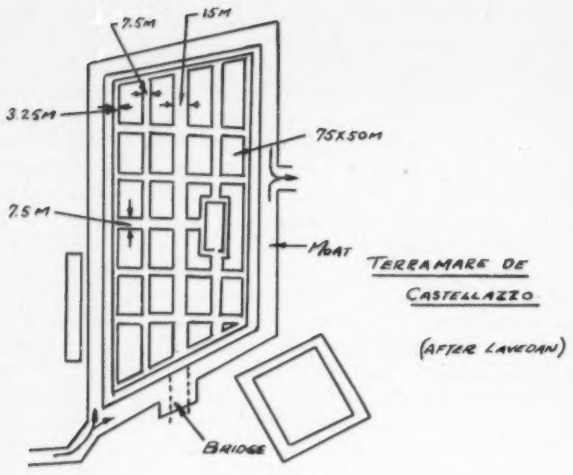


Fig. 3

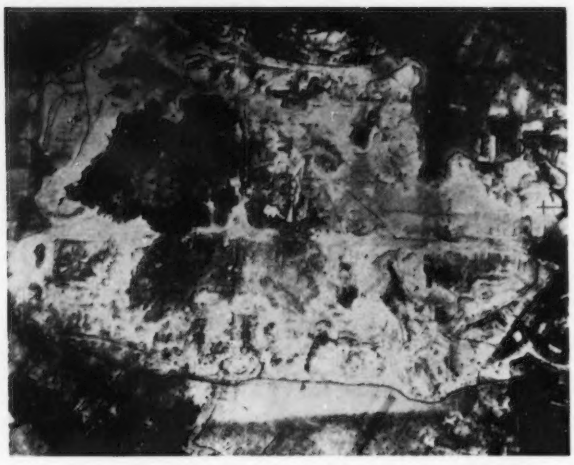


Fig. 4
Air Photo—Seleucia.

able to suggest the evolution as outlined above. Examples of this class of town plan may be found in Cyrene, Selinus, Ostia and Gerasa as well as in the already mentioned Priene and Dura. The main street often was twice as wide as the ordinary streets while the main cross street usually was only slightly wider than ordinary.

One step further in the town planning scheme leads to the chess board or rectangular block and street system. The towns which used this pattern were special purpose towns, good examples being the military outposts established by the Greeks in Asia Minor.

Running parallel to the development of the street system in planned towns is found the evolution of the defenses of the town. The very early town had simple defenses consisting of earth mounds with wood palisades. During the early periods the townspeople of Greece and Asia-Minor usually had a fortified hill to retreat to when necessary. It was not until the 5th century B.C. that the Greek towns built walls. But thereafter the pattern was set with walls, acropolis, moats, etc. The fortifications of a town had a definite effect on the street and block plan. The gates determined the location of the main streets or vice versa. Also the limited space to be found within the fortifications of a hill top, an island, a peninsula or a built-up swampland area did not allow for wide streets and open spaces.

Returning to the consideration of street patterns, the checker-board scheme of street lay-out remains for discussion. The Hippodamium plan with block length to width ratio in the neighborhood of 2:1 and the Roman Military camp plan which calls for a 1:1 ratio are usually conceded to be the basic patterns. But, the rectangular street pattern was known and used long before Hippodamus of Miletus was born, in fact his home town was reported to be of this pattern although it was replanned in Alexander's time.

Two very early towns with rectangular street patterns are well known. Kahun in Egypt was built in 2500 B.C. to house workers on the Illahun pyramid. This example of a rectangular street plan is not considered by all authorities as an authentic town plan because of its small size and limited use. One section (Fig. 2) consisted of six elongated blocks separated by narrow alleys all enclosed by a wall. Important dwellings in the other sections of the town were located on blocks 138' x 198' which is about the same size as the entire section just described. The other town is called Terramare de Castellazzo in Italy. This town existed from 1400 to 800 B.C. and belongs to the Bronze Age. The plan of this town (Fig. 3) is particularly interesting because it includes all the ingredients of city plans of the Hellenistic and Roman periods.

The Hellenistic town plan was spread throughout the Alexandrian area of influence and in particular to frontier towns. These towns were planned, and built as entire units although there was considerable unusued space for expansion within the walls. The block length to width ratio was usually 2:1 with actual measurement 300 x 150 greek feet. The greek foot measured 0.352 meters or 1.15 English feet. Examples of these town plans are Antioch, Apamea, Laodicea, Damascus and Aleppo. Seleucia also has a Hellenistic plan with block length to width ratio of 2:1 but the actual measurements reveal larger blocks 400 x 200 greek feet. (See aerial photo and reconstructed street plan of Seleucia prepared by Mr. Clark Hopkins, University of Michigan.

The Roman Military Camp town with the traditional two main cross streets plus a minor street pattern completing

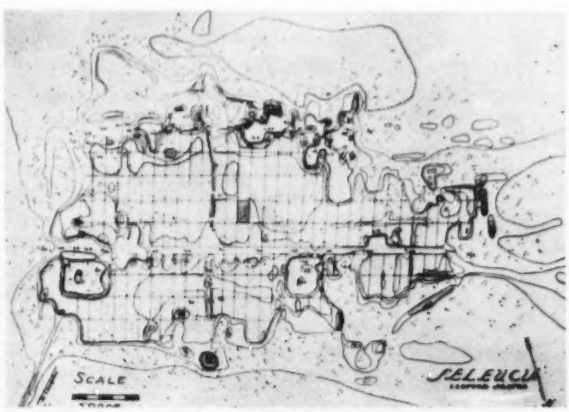


Fig. 5
Street Plan of Seleucia.

(Continued on page 393)

TABLE OF TOWN PLANS
STREET WIDTHS — BLOCK MEASUREMENTS

TOWN	YEAR OF PLAN	BLOCK RATIO	LENGTH WIDTH	RECTANGULAR PATTERN	STREET WIDTHS Major	Minor	Others	REMARKS
Kahun, Egypt	2500 BC	6:1	197'x30'	Yes	26'		6.5'	Walled area to house Illahun pyramid workers.
Babylon, Mesopotamia	2200 BC	8:7*	150'x133'*	Not General				Avenues to gates fairly straight.
Ur, Mesopotamia	2100-1900 BC			No				One main street or processional way.
Tylisos, Crete	Pre-Historic			Occasional in Suburbs				
Terramare de Castellazzo, Italy	1400-800 BC	3:2	246'x164'	Yes	49'	24.5'	10.6'	Bronze Age, 3 streets lengthwise, 5 cross streets.
Selinus, Sicily	648-409 BC			Yes	30'	18'	10'	Two main streets cross at right angles.
Cyrene, N. Africa	7th Cent. BC			Not General				Processional way and 2 main streets cross at right angles.
Athens, Greece	Hellenic			No				No plan, narrow meandering streets.
Sparta, Greece	Hellenic			No				No plan, narrow meandering streets.
Olynthus, Greece	Hellenic	5:2	292'x116'	Yes	29.6'	23'	16'	Blocks 250x100 Greek ft.
Miletus, Greece	479 BC	2:1	180'x96'	Yes				Several Agoras, blocks usually square cut by alley, blocks 170x84 Greek ft.
Thurii, S. Italy	443 BC			Yes				
Rhodes, Egypt	408 BC			Fan Shape				
Dura-Europos, Syria	End 4th Cent.	2:1	230'x115'	Yes	41.5'	27.7'	20.8'	Agora and streets encroached on, blocks 200x100 Greek ft.
Ostia, Italy	End 4th Cent.			No				Port of Rome, earliest traditional Roman two cross streets.
Alexandria, Egypt	332 BC	1:1*	1082'x984'	Yes				Roman replan, 7 streets E. & W., 13 streets N. & S., blocks 1,000x1,000 Greek ft.
Priene, Greece	330-130 BC	4:3	155'x116'	Yes (in part)	23'	15±'	11.5'	Main feature Agora, 2 main streets cross, blocks 135x100 Greek ft.
Piraeus, Greece	Hellenistic	5:4	590'x460'	Yes				Harbor Town of Athens, blocks 500x400 Greek ft.
Seleucia, Mesopotamia	319 BC	2:1	460'x230'	Yes				Blocks 400x200 Greek ft.
Antioch, Adamea, Damascus Laodicea, & Aleppo	Hellenistic	2:1	360'x171'	Yes				300x150 Greek ft.
Gerasa, Mesopotamia	200 BC 63 BC Roman	3:1	328'x98'	Not General				Traditional Roman two cross streets, blocks 285x85 Greek ft.
Carthage, N. Africa	123 BC	4:1	500'x130'	Yes				Replan 1st Cent. AD long blocks, blocks 520x135 Roman ft.
Naples, Italy		5:1	590'x115'	Yes (in part)				Blocks 500x100 Roman ft.
Pompeii, Italy	80 BC			Yes (in part)				Several plans, including long blocks like Naples.
Orange, S. France	45 BC	2:1	233'x116'	Yes				Blocks 240x120 Roman ft.
Silchester, Britain	Last 1/3 1st Cent. BC	1:1	400'x400'	Yes				Roman military camp, blocks also 260'x240', 400'x260'.
Calleva (Caerwent), W. Britain	Roman	1:1	120'x110'	Yes				Roman military camp.
Knidos	Roman	5:3	164'x95'	Yes				Roman military camp, blocks 170x100 Roman ft.
Lincoln, England	75 AD			Yes				Roman military camp.
Timgad, N. Africa	100 AD	1:1	69'x69'	Yes			15-16'	Roman military camp, blocks 70x70 Roman ft.

*Based on Insufficient Data.

T.D.L.

Buffalo

AN INTERNATIONAL COMMUNITY ON THE "NIAGARA FRONTIER" WITH A WEALTH OF NATURAL AND MAN-MADE WONDERS

By Edward F. Gibbons

TRAFFIC ENGINEERING appreciates the courtesy of Editor Jack A. Fritzlen of the Chrysler Events Magazine in permitting us to reprint this interesting article for the benefit of those who will be visiting Buffalo for the first time during the forthcoming ITE Annual Meeting, September 28—October 1. The article appeared in the July 1953 publication which is distributed monthly to the thousands of owners of Chrysler cars. We are sorry that it is not possible for us to reproduce the seven beautiful color photographs illustrating this feature in Chrysler Events.

THE NEXT TIME you have a family get-together to decide on a good place to visit this summer, why don't you suggest that your family "shuffle off to Buffalo and the Niagara Frontier" in that spanking new Chrysler? Don't take "No" for an answer—and you'll enjoy a vacation that truly has everything.

Going east from anywhere, your favorite travel counselor will guide your way to Buffalo over good roads. There will be plenty to see en route but save a good deal of time for the things you won't want to miss when you arrive in the "City of Good Neighbors."

That title, by the way, is not just a catchy slogan cooked up by an over-zealous Chamber of Commerce. It has real basis in fact. Buffalo is your entrance to a community unique in world history, one great community of two peoples, one American, one Canadian—each on its respective side of the majestic Niagara River, each firm in its loyalty to its own country, but with the deepest respect and admiration for the other. Most people are apt to forget that Buffalo is on an international border—so free is the passage from one country to another—so neighborly are the two peoples.

Don't look for towering skyscrapers as you near Buffalo. Its skyline reflects the small-town friendliness that makes Buffalo outstanding among big cities. In growing, this city and its people haven't forgotten how to say "Hello, friend."

To see the city in a brief time, drive west from Lafayette Square over Court Street to McKinley Monument (named for President William McKinley, assassinated at Buffalo's Pan American Exposition in 1901). Speaking of presidents, Buffalo gave two to the nation, Millard Fillmore and Grover Cleveland. Directly ahead you will see the City Hall, a magnificent structure of 24 stories. Make a note that you can get a mighty fine view of the entire city from its tower. Now take a quarter turn around the circle and bear right on Delaware Avenue past the Hotel Statler.

You are now on *the* residential street in Buffalo. Business has made some slight inroads in the downtown area. It is admittedly too narrow for the great flow of traffic but, to widen it, many thousands of giant elms would have to go—surprisingly enough, natives reject such a move. Buffalo is proud of its trees and guards them jealously.

Buffalo's Niagara Square in front of City Hall; Statler Hotel at right.

Going north on Delaware, you will enjoy hundreds of mansion-type homes, a few of which have been turned over to charitable organizations like the Red Cross but, in the main, still lived in by Buffalo's best families. A short drive to the left over North Street will bring you to Kleinhans Music Hall, acoustically perfect and the home of the Buffalo Philharmonic. Now back to Delaware which is followed to Delaware Park, the largest of Buffalo's park system of 3,000 acres. The kiddies will enjoy its world famous Zoo with animals from all over the world in settings that reproduce their natural habitats. You'll peek through no bars here—rather you'll get the impression of walking through an area where all the animals are free to roam. The rest of the family might enjoy its fine golf course, canoeing on Park Lake, the famous Albright Art Gallery with its St. Gaudens replica of the Parthenon's Porch of the Maidens and an art collection among the best in the East, or the Buffalo Historical Society Building. If you stop there, do so just before the hour and watch the parade of the Apostles on the Clock of the Apostles, the wonder timepiece in their collection.

Going east from Delaware Park, follow Humboldt Parkway to the Buffalo Museum of Science. This is the home of the Transparent Man, an exact replica of the human body in clearest glass. They have a fine planetarium and an exceptional display of Indian lore. Then drive back downtown on Genesee Street. This circle drive should whet your appetite for more of Buffalo and there's lots more to see.

Lake Erie has many fine bathing beaches on both the American and Canadian Shores; the best are Crystal Beach, an amusement park in Canada reached by boat, and Beaver Island State Park on Grand Island. Niagara River is a fine place for the fisherman.

To the south of the city lies the Cattaraugus Indian Reservation; to the north the Tonawanda Indian Reservation—both reminders of the people who once roamed and owned this frontier area.

Buffalo's international and cosmopolitan flavor makes for

a wide variety of restaurants. To name a few, there's Laube's Old Spain, Gandy's Sea Food House, Chef's Restaurant (Italian), Mexican Inn, Chin's Chow Mein, Sandler's Kosher Restaurant, the Rosticerria (open hearth roasting of your favorite fowl), Kathryn Lawrence Tea Room (where Teddy Roosevelt took the oath of office as President of the United States in 1901), and the 300 Parkridge Club (for the gourmet in the family). If you like music with your meals, the Terrace Room at the Statler will please you. If you prefer dining at a night club, try Chez Ami, the home of the revolving bar. Your pocketbook won't be strained at any one of these restaurants. Many fine shops, first-run theatres and Broadway plays at the Erlanger Theater will make your stay in Buffalo more enjoyable.

Time to see Niagara Falls, that most romantic spot for honeymooners but still a scenic "must" for those entering the later rounds of the battle of life. Start the way you did on your tour of Buffalo but take Niagara Street from McKinley Monument. Look for the "Peace Bridge" signs. In a manner of minutes you'll arrive at this gateway to Canada. A word of history here and a word of caution.

The Peace Bridge is a symbol of international comity. It links two great nations and was built in commemoration of more than a century of peace.

The word of caution concerns the papers necessary in entering and leaving Canada. Make sure that you have the car registration papers along and some identification for each passenger. The latter is most important in re-entering this country, especially if there is a trace of accent. Birth certificates, tax receipts, driver's licenses will do fine. A brief stop to secure a permit for your car is the greater inconvenience.

Once acrosss tshe bridge, you are in for a wonderful 21-mile drive along the banks of the Niagara River. Halfway to the Falls, you will see Grand Island to your right and you can drive across it on the way back to Buffalo. Soon the roar of the mighty cataract will let you know that scenic pleasure is in store. The current of the river is seen to pick up—little whitecaps appear—first a few—then the river is completely covered.

Niagara Falls, Ontario! The river at this point begins to boil and seethe in its rush to the thunderous Falls. As you stop in Queen Victoria Park and take your first look at Niagara Falls, you won't say much—not for a long while. It has that effect on everyone. Here is Nature in all its majesty—a sight you'll never forget—a sight you will love to remember. Left to right, you will see the American Falls, the Bridal Veil Falls, Goat Island and the Horseshoe Falls. You are standing at the top of Niagara's Gorge. There's a fine mist in the air and the sun has carved out a beautiful rainbow to frame this awe-inspiring panorama. Words cannot be found to describe this scene.

When you cross back to Niagara Falls, N. Y., in a day or two, you can descend to the base of the American Falls by elevator, drive out on Goat Island for a close-up look at the brink of the Falls and visit the Cave of the Winds. Another treat is a trip on the Maid of the Mist, that little boat almost lost in the vastness of the Gorge. It's wet but wonderful.

Don't miss Oakes Gardens. You've all seen flowers before but Nature has a way of outdoing itself at Niagara. Canada has done a marvelous job of preserving the beauty that preceded the tourist influx.

Niagara Falls in color—words fail me. You'll thrill with excitement as the colors play on the tremendous cataract, constantly changing, bringing out new faces and transforming the Falls. Have dinner in the Rainbow Room of the General Brock Hotel for a view that's out of this world. Need I mention why a camera should go along on this trip?

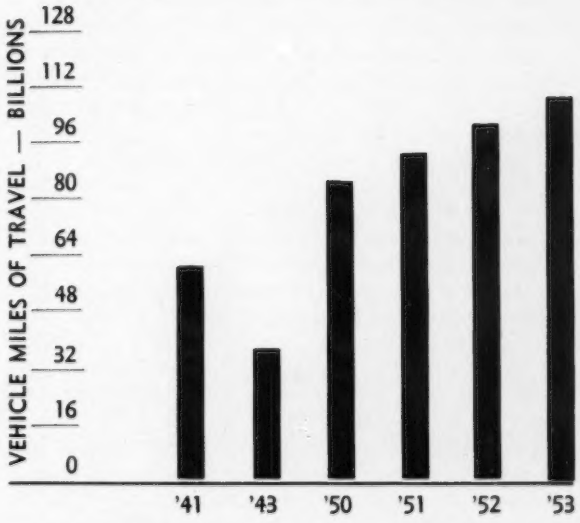
The next day, drive further down the river to see the Whirlpool Rapids, the Whirlpool itself with its cable car, and some magnificent views as the Niagara River meets Lake Ontario. Directly across on the American side stands reconstructed Fort Niagara with blockhouses, a powder magazine, a hot shot oven and battery, the bakery, ramparts, battlements and the "Castle." Plan to visit it out of Niagara Falls, New York.

Mom interested in fine English china? At Niagara Falls, Hamilton and Toronto in Canada, there are stores galore. If you stay in Canada 48 hours, you can bring back $200 worth of goods, duty free. A 12-day stay in Canada raises the exemption to $500. Just be sure you declare everything. That tourist permit for your car entitles you to use any exit from Canada.

From Niagara Falls, N. Y., you can return to Buffalo by Grand Island or by the river road through numberless electrical and chemical plants.

That's "Niagara Frontier," the fabulous international community that has everything including an air conditioned summer climate you'll wish you could take home with you.

Traffic Trends



TRAVEL ON RURAL ROADS FOR THE FIRST FIVE MONTHS OF 1941, 1943, 1950, 1951, 1952 and 1953.

Based on Bureau of Public Roads Data

Traffic Signals That Think

By Charles R. Waters (Mem., ITE)

District Engineer, State of New York, Department of Public Works, Buffalo, New York

RECENTLY COMPLETED and successfully operating on State Touring Route 5 in the City of Lackawanna, Erie County, is a progression-type system of eleven interconnected traffic control signals. Route 5 in this area is known locally as the Hamburg Turnpike.

The Turnpike reconstructed in 1951 to provide two lanes of travel in each direction, with additional widened areas for right and left turns, and bus stops, presented an unusual signalization problem. The Bethlehem Steel Company plant on the west side adjoins Route 5 for a distance of some two miles with several entrances well spaced apart. City streets leading into business and residential areas lead in from the opposite side. During shift changes at the Bethlehem Plant, the demand for cross street green is strong; at other times there are only occasional vehicles entering and leaving the plant. Likewise, pedestrian crossing during shift changes are numerous.

Some 19,500 vehicles comprised of commuters, interstate trucks and tourists, as well as local traffic made up of Steel Company employees and local residents, use the Turnpike daily between 7 A.M. and 7 P.M.

The system installed is very flexible and is able to adapt itself to changing traffic conditions automatically. The brain of the system is the Master Controller, which through its sampling detectors count the traffic in each direction and adjusts itself every six minutes. It automatically selects one of three offset patterns (inbound, outbound or average). Each offset pattern has a full range of cycle lengths. Master Controller "commands," automatically dictated by the artery traffic, are conveyed to local controllers by means of a neoprene jacketed aerial cable. There is a local controller at each signal location. Besides receiving "commands" from the Master Controller, each local controller also receives calls from the push buttons and vehicle detectors located on the side streets at each signal location.

The green light normally rests on the Turnpike and is displayed to the cross street only upon actuation (by push button or vehicle detector), and then only at such times as will not interfere with the progressive movement set up for the artery traffic by the Master Controller. Furthermore, the green light is held on the cross street only for the length of time corresponding to the actual demands of traffic, since the dispatchers in the local controllers provide time extension features. Such an arrangement makes very efficient use of the cross street green resulting in a wider travel band on the artery or a progressive system *plus*.

For all but the maximum traffic loads the cycle used and found to be most efficient is 60 seconds. Cycle length increases to 75 seconds for maximum loads and when traffic density is below a minimum volume signals operate independently. The first vehicle hitting the cross street detector receives 11 seconds of cross street green. Each succeeding vehicle, approaching when the cross street signal is green, is assured of 5 seconds in which to move from the detector into the intersection. The 5-second periods are not cumulative because each vehicle, as it crosses the detector, not only starts its own 5-second period, but simultaneously can-

(Continued on page 392)

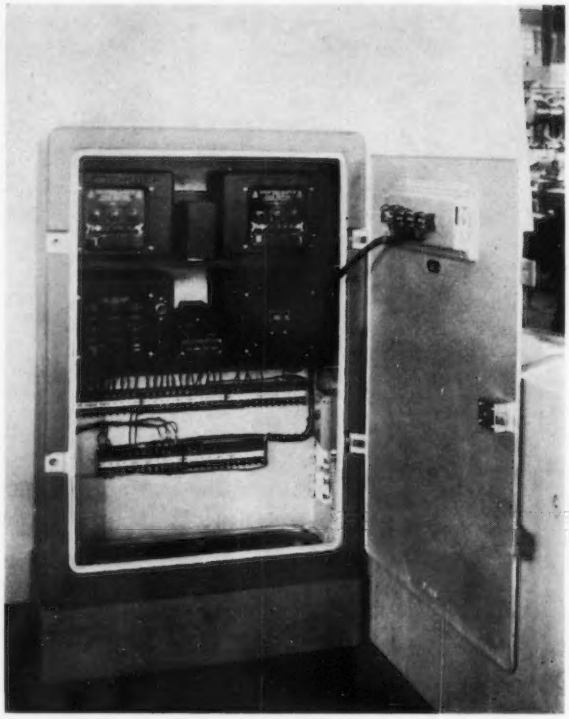


Fig. 1
The Master Control Units.

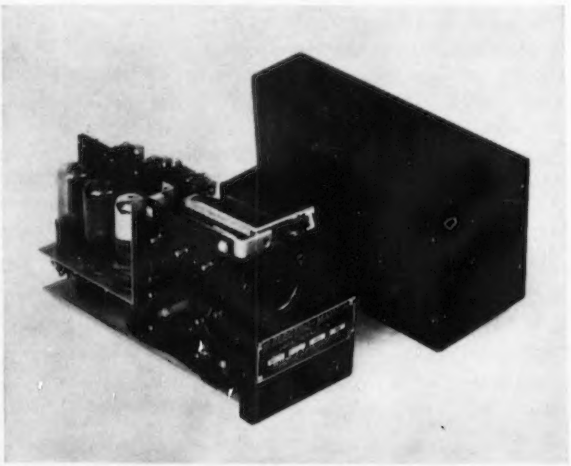


Fig. 2
The offset unit controlling the "Yield" circuit of each semi-actuated controller.

See what they've done to a STOP Sign!

They took a base of aluminum alloy... put on a face of "Scotchlite" Sheeting, and they turned out the lightest, brightest, longest-lasting stop sign of them all!

IT'S THE ALSTOP 101!

Yes, "Scotchlite" Reflective Sheeting says STOP... aluminum alloy backs it up. And this revolutionary new principle in sign construction cuts your maintenance costs to the bone!

Lightweight (but sturdy enough to *stand* on!), the ALSTOP 101 is easy to handle, easy to erect. Lasts for years with minimum upkeep. Aluminum alloy back is rust-proof, chip-proof... requires no painting or further finishing. Smooth-surfaced face of new Flat-Top "Scotchlite" Sheeting is practically self-cleaning.

There's a supplier near you with a complete selection of America's finest highway signs. For his name and location, write or phone 3M Co., Reflective Products Div., St. Paul 6, Minn.

Reg. U.S. Pat. Off.

SCOTCHLITE

BRAND

REFLECTIVE SHEETING

Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Brand Pressure-Sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York, 17, N.Y. In Canada: London, Ont., Can.

Reference Notes

By Arnold G. Fisch (Assoc. Mem., ITE)
Traffic and Safety Engineer
New York State Thruway Authority, Albany, N. Y.

LOWER CASE ALPHABET SIGNS

THE ACCOMPANYING PHOTOGRAPH shows one of a series of signs which is part of a continuing program of sign testing being conducted by the New York State Thruway Authority. This is the first traffic sign erected on the Thruway on which lower case letters were used in part of the copy. This particular sign was erected for a dual purpose: to check driver reactions to lower case letters, colored signs, and large signs, and to provide a warning that the end of the section of Thruway presently open to traffic would soon be reached, and existing local highway operating conditions would again be encountered.

The overall size of the sign is 6'0"x25'-0". The first line of copy consists of 24" P.R.A. series E upper case letters and corresponding 18" loop height lower case letters patterned after the alphabet developed by Forbes, Moskowitz, and Morgan. (See Proceedings, Highway Research Board, 1950, page 358). The second line of copy consists of 16" P.R.A. series E upper case letters. The interline spacing used on this sign was 12", or two-thirds of the loop height. As a result of the encroachment of the tail of the y on the second line of copy, it was decided to use an interline spacing equal to the full loop height of the lower case letters on future signs.

The sign consists of cut-out silver letters over a reflectorized royal blue background adhered to panels of .040" thick 51S½ aluminum sheets. The aluminum panels are fastened to the wood backing with brass screws. The frame and wood backing was constructed in the field by Department of Public Works maintenance forces.

This sign was erected on March 31, 1953. To date, no unfavorable comments regarding it have been received. Additional signs with lower case copy will be erected later in the summer.

TRAFFIC SIGNALS THAT THINK

(Continued from page 390)

cels out whatever remains of the period set up by the preceding car. The cross street green signal is limited to a maximum of 26 seconds per cycle. A pedestrian crossing the street has 26 seconds. All timings can be adjusted and the above timings were arrived at in the field.

Additional features of the system are advanced left turn arrow indications at certain steel plant gates, vertical and right turn arrows at other signal locations, and an automatic recall unit. The automatic recall unit, which operates from a time clock, automatically gives the cross street a green light after a predetermined time of continuous artery green. This is to slow down speeders during the early morning hours when traffic movements are light. At present it is set at 100 seconds and is in force from 1:00 A.M. to 6:00 A.M. when there is little street traffic.

The system was installed under the direction of the writer by the O'Connell Electric Company of Rochester. A. F. Mallette was the Resident Engineer for the Department of Public Works and the adjusting and timing was done by Harry A. Haugh, Technical Sales Engineer for the Automatic Signal Division.

Since its installation, many compliments, particularly from motorists who previously were bogged down by the obsolete two color isolated signals, have been received.

Be Sure To Go

24th ANNUAL MEETING OF

INSTITUTE OF TRAFFIC ENGINEERS

Hotel Statler

September 28 - October 1

Buffalo, New York

(Continued from page 386)

the checker board is also found wherever the Roman influence extended. It is probably safe to generalize and state that the block length to width ratio was 1:1 and that the normal measurement was close to 100 roman feet. The roman foot measures 0.296 meters or 0.97 english feet. In other words, 100 roman feet = 97 english feet.

The generalization on block measurements (100 x 100 roman feet) is immediately contradicted by measurements of 200 x 100 Roman feet at Dura, 520 x 135 Roman feet at Carthage, 70 x 70 roman feet at Timgad, 240 x 120 roman feet at Orange, 285 x 85 roman feet at Gerasa, and three common measurements at Silchester of 270 x 250 Roman feet, 410 x 270 roman feet and 410 x 410 roman feet. Some agreement to the 1:1 ratio may be obtained if we recognize that some blocks are double blocks in which the separating minor street has disappeared. Another reason for this disagreement may be found in the adoption by the Romans of earlier Greek street layout. And finally, terrain plus crude surveying methods can and probably did introduce errors.

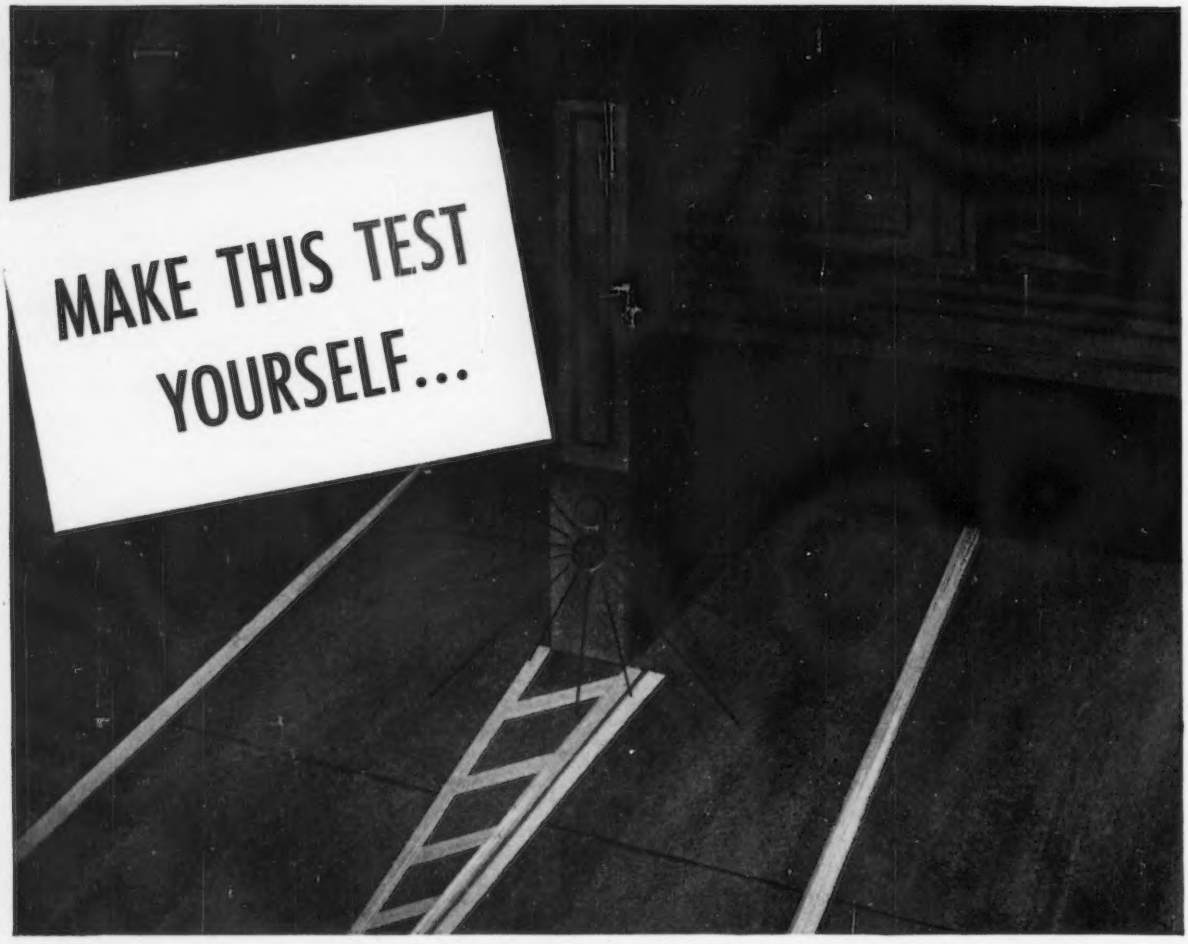
There is insufficient data available on which to build any definite statement about street widths in these Hellenistic and Roman towns. In general the wide main streets are about twice the width of the minor streets and are in the neighborhood of thirty feet and fifteen inches respectively. Street widths and block measurements for quite a few ancient towns are indicated in a following table.

The variations in town plans are too numerous to begin to correlate therefore the conclusions drawn from this investigation are of necessity rather indefinite. It might be said that the ancients did remarkably well in town planning with the tools at their disposal whenever permitted by political conditions. And that people exhibit the same resistance to control for the common good today as they did in prehistoric and historic times.

Bibleography

1. Brown, F. E., *Excavations at Dura-Europos,* Vol. 1-9, 1929-1944, Yale Univ. Press.
2. Bosanquet, R. C., *Greek and Roman Towns, Town Planning in Syria,* Vol. 6, No. 2, Town Planning Review.
3. Frankfort, H., *Town Planning in Ancient Mesopotamia,* Vol. 21, 1950, Town Planning Review.
4. Haverfield, F., *Ancient Town Planning,* 1913, Oxford Univ. Press.
5. Hutchinson, R. W., *Prehistoric Town Planning in Crete,* Vol. 21, 1950, Town Planning Review.
6. Kraeling, C. H. (editor), *Gerasa (Jerash), City of Decapolis,* 1938, Am. School of Oriental Research, New Haven, Conn.
7. Lavedan, *Histoire de l'Urbanisme,* Vol. 1, page 13-17.
8. McDowell, R. H., *The Excavations of Seleucia on Tigris,* Vol. 18, 1933, Papers of the Mich. Academy of Sc., Arts, and Letters, Univ. of Mich. Press.
9. Nuttall, Zelia, *Royal Ordinances Concerning the Laying Out of New Towns,* Vol. 5, 1922, The Hispanic Am. Historical Review. (Excerpt).
10. Robertson, D. S., *Greek and Roman Architecture,* 1929, Cambridge Univ. Press.
11. Robinson, D. M., *Excavations at Olynthus,* Part 12, 1946, Domestic and Public Architecture, The Johns Hopkins Press.
12. Smith, E. B., *Egyptian Architecture,* 1938, D. Appleton-Century.
13. von Gerkan, *Griechische Stadteanlagen,* 1924.

Announcing
The Ametron
ELECTRIC EYE TRAFICOUNTER
—Automatically counts vehicles whenever photo electric beams are broken!
—Ruggedly constructed for permanent, year-round operation—in any weather!
—Prints totals each hour and resets to zero!
—Identifies counts with printed record of exact hour—day or night!
A new vehicle counting and recording instrument which fulfills exacting requirements in installations where conventional roadbed type detecting elements are not desired. A permanent station type, capable of counting up to 1000 pulses per minute. The magnetic counter is solenoid advanced, once for each contact closure (whenever there is an interruption in the light field). Consists of following detector components: two Photocell Excitor Lamps, a transformer for stepping down power supply voltage, a "chopper" to provide light field oscillating characteristics, a lens and mirror assembly, and an amplifier.
STANDARD OF ACCURACY SINCE 1888
STREETER-AMET COMPANY
4101 RAVENSWOOD AVENUE • CHICAGO 13, ILLINOIS
Branches in
Pittsburgh and Allentown, Pa.
Birmingham, Ala.
Bethesda, Maryland
Toronto, Ontario
E. A. Horton Sales Co.
3071 Bloor Street, West
RECORDER HOUSING
LIGHT SOURCE HOUSING



Can your warning signals be seen in time?

Here's a marker that can be seen sooner—giving the driver those precious extra seconds that help avoid accidents. *Test it for yourself* some night. Set up a Stimsonite marker next to any other reflector or reflective material of comparable area. Go back half a mile. Then drive toward them—fast. You'll see the Stimsonite warning first, every time. You'll be able to react in time.

Visibility (target value) depends upon the amount of light from the headlamps that is returned *within the driver's angle of observation*. Light dissipated outside this area is wasted. Every one of the accurately molded cube faces that make up a Stimsonite reflector picks up light from the widest possible angle and *re-directs that light back to its source.*

That's why Stimsonite looks brighter—and provides greater safety for the motorist.

And . . . because these reflecting prisms are integrally molded into the reflector and sealed against dirt and moisture, Stimsonite *stays* brighter!

Stimsonite®

for — *Seeability* / *Readability* / *Durability*

AGA Division of Elastic Stop Nut Corporation of America
1027 Newark Avenue, Elizabeth, N. J.

TRAFFIC NEWS

Governor Warren Receives State's Awards

Participants in Awards Ceremony

Left to right: Paul Hill, National Safety Council; John D. Holstrom, Berkeley Chief of Police, I.A.C.P., 5th Vice-President; Governor Warren; and Joseph E. Havenner, Los Angeles, Director, Institute of Traffic Engineers.

Governor Earl Warren, on behalf of the State of California, accepted three national awards for excellence in traffic safety activities for 1952.

The awards were for first places in traffic engineering and traffic enforcement and for outstanding achievement in driver licensing. This marks the third consecutive year that the state has won highest honors in enforcement and engineering.

The winning scores were based on the annual inventory of traffic safety activities which the National Safety Council and a number of technical and educational organizations conduct each year.

California, for comparison purposes, is grouped with seven other states with major traffic problems: New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois and Texas.

The award for first place in traffic law enforcement was given for the work of the Highway Patrol. Presentation was by John D. Holstrom, Berkeley Chief of Police, Fifth Vice-President of the International Association of Chiefs of Police, the organization which judged the enforcement phases of the inventory.

Joseph E. Havenner, Los Angeles, presented the first place award for traffic engineering on behalf of the Institute of Traffic Engineers. The Institute judged this portion of the inventory which covered activities of the Division of Highways, Department of Public Works.

The drivers license award for outstanding achievement was presented by Paul F. Hill of Chicago, senior field director for the National Safety Council. The award was in recognition of work done by the Division of Drivers Licenses, Department of Motor Vehicles.

Present at the ceremonies were Frank B. Durkee, Director of Public Works; George T. McCoy, state highway engineer; George M. Webb, state traffic engineer; Rodney C. Richardson, Assistant to the Director of Public Works; Milo L. Hewitt, Supervising Inspector, California Highway Patrol; A. H. Henderson, Director of Motor Vehicles, and Tom Bright, Deputy Director of Motor Vehicles.

Governor Warren, after accepting the awards, passed each one along to the state department involved.

ITE CALENDAR

24th ANNUAL MEETING
Hotel Statler
Buffalo, New York
September 27 - October 1, 1953

25th ANNUAL MEETING
Kansas City, Missouri
September, 1954

New Appointments . . .

Nowell Becomes Business Manager

Samuel G. Nowell, Jr. has assumed his new duties as Business Manager of TRAFFIC ENGINEERING Magazine, a position to which he was appointed August 3 by a special subcommittee of the Institute's Board of Direction, headed by T. M. Matson, Director for District 1, as authorized by the Board

Samuel G. Nowell, Jr.

last September. Nowell will handle the magazine's business in both advertising and subscription phases, and will assist with the writing, editing, and production of the monthly publication.

Nowell comes to his new post well equipped with a background of engineering interest and a splendid record in the public relations field. He is 23 years old and a new graduate of the Pennsylvania State College, State College, Pa. Majoring in Sanitary Engineering and extra-curricular work, young Nowell has an enviable college record. He served as an editor on their monthly engineering magazine—The Penn State Engineer—and gained much experience both in the business and editorial field. Sam was chairman of the Community Chest which raised $12,000 in contributions from a student-body of 11,000 students. In addition to being a top member of the College varsity debating team, he was an officer in his local ASCE chapter and presented a paper at this year's student convention. As president of his social fraternity (Chi Phi) and a member of many other student government functions, Sam had to assume much responsibility. As a chairman and as a master of ceremonies to many student projects, he became known as the official "Major Domo" of the Penn State student community.

Sam's college career was highlighted by having the enjoyable task of introducing Mrs. Dwight D. Eisenhower to the Penn State students when she was the honored guest at the school's annual spring carnival to crown Miss Penn State.

Sam was recognized for his fine college activity record by being elected to the distinguished senior society—Lion's Paw—an honor reserved for the fifteen outstanding students of the year.

Sam, Jr. is a son of Gib Nowell, an associate with Gannett Fleming Corddry & Carpenter, the consulting firm with which Robert Mitchell (past President ITE) is associated. His father assisted with the construction of the Pennsylvania and New Jersey Turnpikes and is now working with the Harrison Construction Co. on the Boulevard of the Allies Interchange job in Pittsburgh.

Nowell, whose hometown is Hollidaysburg, Pa., worked for the Gannett Fleming firm for several summers. He worked as a transitman on a Pennsylvania Department of Highways survey party for three summers, and has engaged in various phases of engineering work for a private engineer in Altoona, Pennsylvania.

Besides the interest in the publications field that Sam has, his several pastimes cover the year's four seasons. Hunting, sailing, and golf for the outdoor diversions, while his winter hobby is devoted to the raising and breeding of tropical fish. Our new Business Manager plans to be married in the early part of September.

Position Available

MADISON, WISCONSIN
CITY TRAFFIC ENGINEER
Excellent beginning salary. Annual increases are automatic. Applicants must be registered professional engineers. Applications will be accepted until the position is filled.

Write:
PERSONNEL DIVISION
City Hall,
Madison 3, Wisconsin

Myers Takes New York City Post

Dwight T. Myers (Mem., ITE) former Traffic Engineer for Providence, Rhode Island, was sworn in as the Deputy Traffic Commissioner for the Department of Traffic of New York City on June 15, 1953, by Commissioner T. T. Wiley. In his new post as Deputy Commissioner, Mr. Myers will serve as Chief Engineer of the Department in charge of the Division of Design, Division of Control, and Division of Maintenance.

The Division of Design is responsible for surveys, automatic traffic counts, traffic signal design, parking meter design and layout, off-street parking facilities, and City Wide traffic planning. The Division of Control is responsible for signs and pavement markings, and the Division of Maintenance supervises the contracts regarding installation of Traffic Control devices and the maintenance of all traffic control devices.

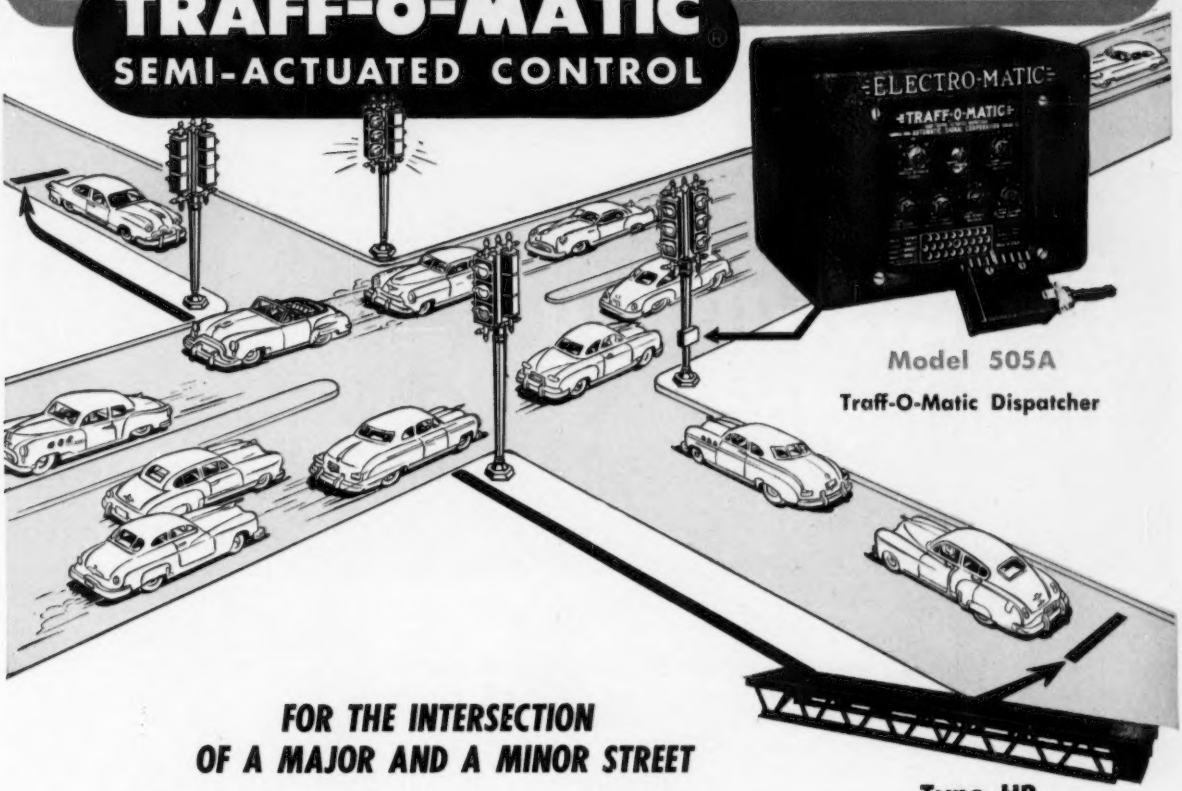
Mr. Myers, a native of Johnstown, Pennsylvania, received his degree in Civil Engineering in 1932 from the University of Pittsburgh. Previous to his attendance at the Yale University Bureau of Highway Traffic, he obtained ten year's experience in the many phases of city engineering. As a Field Engineer for Johnstown, Myers was in charge of the construction and office design work, and later served as Assistant City Engineer in that City.

Upon completion of the Traffic Engineering course at the Bureau of Highway Traffic, Mr. Myers was appointed Director of the Bureau of Traffic Engineering and Planning in Johnstown in June, 1942. The following September he entered the Navy's Civil Engineer Corps, serving until October, 1945, when he received his discharge as a Lieutenant. From December, 1945 until March, 1949, he served as Highway Engineer for the U. S. Bureau of Public Roads in Boston. In March, 1949, Myers left the Bureau of Public Roads to become the first Traffic Engineer for the City of Providence, and organize the new traffic engineering department. In September, 1951, he was named Managing Director of all parking facilities for the City of Providence.

(Continued on page 399)

A controller that *THINKS* moves traffic more efficiently...

TRAFF-O-MATIC®
SEMI-ACTUATED CONTROL



Model 505A
Traff-O-Matic Dispatcher

Type HR
Pressure Sensitive Detector

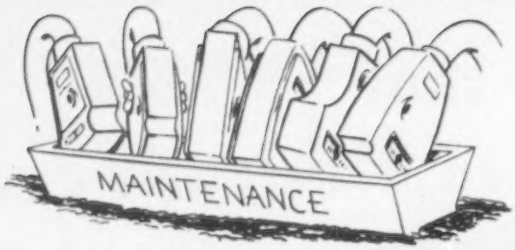
FOR THE INTERSECTION OF A MAJOR AND A MINOR STREET

- Green light remains on major street except when called by minor street detectors or push buttons.
- Minor street right-of-way accurately proportioned to demand.
- Accurate, flexible electronic control of modern proven design.
- All timing intervals independently knob-adjusted.
- Coordination with adjacent intersections.

Send for literature on Model 505A

TRAFFIC ACTUATED®

Automatic Signal Division
EASTERN INDUSTRIES INCORPORATED
NORWALK, CONNECTICUT
In Canada, Northern Electric Co., Ltd., Belleville, Ontario



Are Your Parking Meters Eating Their Heads Off in Maintenance?

If so...switch to time-tested MI-CO's

Here's the one big reason why MI-CO Parking Meters are becoming increasingly popular . . . *maintenance expense is so low it's negligible.* And the reasons behind this record of low-cost upkeep are correct engineering and simple, rugged construction.

Wherever MI-CO's are installed it's rare indeed that parking spaces are denied motorists because the meters are down for repairs. And when a MI-CO does need attention, the adjustment is usually made in a few minutes at the meter location. Motorists know, too, that MI-CO's can be depended upon to deliver *all the time purchased—every time.*

For the city, the unusually low maintenance of MI-CO Meters means fewer headaches and consistently higher earnings. We'll stack up against every other parking meter MI-CO's maintenance and earnings records—for one year, or from installations ten years and older.

MI-CO offers two types of meters—the MI-CO Manual and the original MI-CO Twin Automatic. Both have been time-tested in operation for years under all sorts of weather conditions from Alaska to Key West—in Honolulu and Switzerland.

So if you contemplate a new installation, or if you plan to purchase additional meters you'll be wise to make them MI-CO's. And if your present meters are eating their heads off in maintenance—switch to time-tested MI-CO's. Write for the complete story. Then judge the merits of MI-CO Parking Meters.

MICHAELS PRODUCTS:

Store Fronts
Lettering
Check Desks
Lamp Standards
Marquees
Tablets and Signs
Name Plates
Astragals
Railings
Grilles and Wickets
Kick and Push Plates
Push Bars
Thresholds
MI-CO Parking Meters
Museum Trophy Cases
Bronze and Aluminum Doors
Bank Screens and Partitions

MI-CO METERS, 241 Court St., Covington, Kentucky
Division of The Michaels Art Bronze Co., Inc.

Letter to the Editor

Sir:

Your June issue of Traffic Engineering arrived several weeks ago and I have been studying the cover very intently trying to figure out the traffic movement at the intersection near Chicago's first underground garage.

Unless there is something that I haven't been able to detect, it appears to me that the bus in the upper left hand corner is going to run into the convertible coupe, which is just passing the policeman in the center of the photograph. I don't see how the bus is going to get over on the right side of the double white line unless someone takes down the barricade and "I do mean quick."

I suppose many others have been interested in the same question, but I would like to know just how this movement is accomplished.

You are certainly doing a good job with the magazine as of late, and if I can be of any help, please let me know.

Fenton G. Jordan, Jr.
Traffic Engineer

Norfolk, Virginia

Thanks, Fenton. When forwarding the photograph for this cover TRAFFIC ENGINEERING's Associate Editor Ted Siegel wrote:

"One of the things that you may notice is that a bus in the upper left hand corner with a string of vehicles behind it seems to be in the wrong lane, although there is an arrow in front of it which seems to be leading it into the wrong lane. On checking, I found that this bus is waiting to make a left turn into Randolph Street as differentiated from the other vehicles which you see going in effect straight through on Michigan Avenue."—EDITOR.

Bring the wife for four days of fun and business, September 28 to October 1, Hotel Statler, Buffalo, New York.

Myers is sworn in by Wiley.

MYERS TAKES NEW POST

(Continued from page 396)

As an integral part of successful traffic engineering, Myers worked very closely with the other city departments, and was a welcome speaker at many civic functions. His numerous speaking engagements on the subjects of traffic education and public safety, and his radio and TV appearances were an invaluable asset in bringing to the people an understanding of the need for many traffic changes, and the necessity of cooperation in any traffic or public safety program.

Deputy Commissioner Myers, in addition to being a Member of the ITE, is a registered professional engineer, belongs to the National Society of Professional Engineers, and is a member of the Committee for the Revision of the National Uniform Traffic Ordinances.

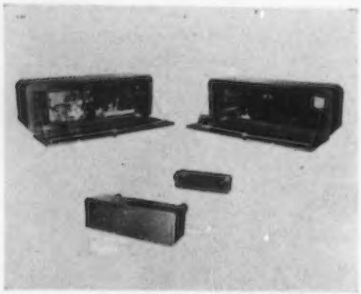
Grotelite
SMOOTH
S S
SURFACE
REFLECTIVE SHEETING
This highly reflective, smooth surface flexible sheeting makes a smashing, attention-compelling sign with greater day and night value. The smooth, self-cleaning surface can be screened, sprayed or brushed. It is easy to apply and makes the best long life signs and marking devices.
GREATER SAFETY
LONGER RANGE
DURABILITY
ECONOMY
Write for complete description, samples and prices.
THE Grote MFG. CO.
BELLEVUE, KY.
(Opposite Cincinnati)
STOP
STOP AHEAD

The New Ametron Electric Eye Traficounter

Streeter-Amet Company of Chicago announce that they have perfected a new traficounter which counts by photo electric beam the number of vehicles passing on a highway. They call it the Ametron Electric Eye Traficounter. The breaking of a photo electric beam automatically counts and records the passing of cars.

It is ruggedly constructed for permanent, year-round operation in any weather. It prints totals each hour and resets to zero; it identifies the counts with a printed record of the exact hour. It fulfills exacting requirements in installations where conventional roadbed type detecting elements are not desired. It is a permanent station type, capable of counting up to 1000 pulses per minute.

An interesting brochure on this Ametron Electric Eye Traficounter may be obtained by writing to Streeter-Amet Company, 4101 Ravenswood Avenue, Chicago, Illinois.



Illinois Schedules Traffic Engineering Conference

The Sixth Annual Illinois Traffic Engineering Conference will be conducted at the campus of the University of Illinois at Urbana on November 3 and 4. The Conference is sponsored by the Department of Civil Engineering of the University, the Illinois Division of Highways, the Illinois Municipal League, and the Midwest Section of the Institute of Traffic Engineers.

All municipal organizations are being urged to send at least one representative to the meeting.

Separate "classroom" type sessions will be held for officials of limited traffic experience, thus enabling them to better understand the basic techniques of successful traffic operation.

Requests for additional information may be addressed to R. K. Newton, Supervisor, Engineering Extension, 713½ South Wright Street, Champaign, Illinois.

Completely Automatic

NEW

Standard 4-Way Self-contained

"TRAFFIC SENTRY" PORTABLE TRAFFIC SIGNAL

Equipped with ITE approved 8⅜-inch diameter prismatic diffusing lenses. Each lens is illuminated independently.

Available with manual remote control.

Self-contained battery-operated Traffic Sentry Portable Signals can be kept in service for 18 continuous hours or 32 hours of intermittent service without recharging. The charger is housed in the base assembly and it is a simple matter to keep the battery charged and the signal in good operating condition at all times.

PORTABLE TRAFFIC SIGNALS, INC.

1620 South Hill St. Los Angeles 15, Calif.

Next Month in Traffic Engineering

There will be twelve different feature articles in our Convention issue — all describing the expanding road and traffic program now in progress in the Niagara Frontier area. Several of these very timely and interesting articles are:

Construction Progress on the New York State Thruway
Arnold Fisch

Untangling Traffic Congestion in New York State's Niagara Frontier
Charles R. Waters

Erie County Expressway Plan
H. Dale Bossert

What Part Will Buffalo's Present Parkways Have in the Traffic Plan for the Future?
A. Russell Tryon

Buffalo Tackles Its Parking Problem
James A. Whitmore

Peace Bridge
Joseph French

See you at the Statler.

Secretary's Column

There are several items to be commented on this month. First and foremost, I hope all our members, readers, and advertisers will give our magazine's new Business Manager, Sam Nowell, the same fine cooperation you've all given me.

Sam is going to be a tremendous help by relieving me of many time consuming details and will give attention to many matters which I have had to let slide in the past for want of time. In addition to handling all advertising, he will assist with the writing, editing and mechanical production by way of proofreading and assembly of the makeup dummy each month. With our combined talents I am sure we will go forward with a better magazine to merit an expanded circulation and a rewarding increase in advertising.

Another item relates to the future of the Annual PROCEEDINGS. All members have been furnished their copy of the 1952 PROCEEDINGS which was produced by reprinting in a reduced size the magazine pages carrying the original 23rd Annual Meeting papers. There seems to be a difference of opinion among the membership as to the value of this volume of PROCEEDINGS, and even some doubt as to whether we should have produced it at all, since the size of the print had to be so drastically reduced. Many members seem to prefer the papers being first published in the magazine, as this spreads their careful review over several months and breaks the study required into small doses. On the other hand, most members prefer the volume form for reference file purposes.

For the 1953 PROCEEDINGS I am recommending the following plan. We should continue to print the papers in the magazine, except that we would print the papers in a three column format taking care to keep all headings and cuts less than two columns in width. We would preserve the type and, when ready to produce the volume, would remake the pages in a two column format 6″x9″ in size, with type of the same size you are now reading. I hope all of our members will think about this problem and take the time to write me what their wishes are.

Somehow through error there crept into the bottom of the middle column of page 332 of the June TRAFFIC ENGINEERING a paragraph, unrelated to any other item on the page, which by implication indicated that copies of the Traffic Engineer's Technical Notebook were still available. This is not true, as the first and only edition of the Notebook was completely exhausted last December and no plans for a second printing have been completed, or even seriously considered.

Finally, I want to do what we can to correct another unfortunate "slip that passed in the night." The January magazine carried Mr. Martin Bruening's paper, "Traffic Control Signals," presented at the Chicago meeting last year. A misprint which occurred in the second paragraph of the first column of page 133 is carried over into the first column of page 21 of the 1952 PROCEEDINGS. Mr. Bruening's original sentence read: "If according to the foregoing, a to-scale grid-spacing diagram is prepared . . . .," which we printed to read: "If according to the foregoing, a two scale grid spacing diagram is prepared . . . ."

We hope the members upon reading this will make the correction to their copy of the PROCEEDINGS; we extend Mr. Bruening our sincere apologies.

TIM TODD

Designed to meet Public Road Administration specifications for spring mounted Beam Type guard rail. Stiffer than standard-type TUTHILL brackets, the No. 4 gives shock-resistant deflection for rail, cushions shock to vehicle and occupants. Superstrong Hyway Guard requires only single bolt through post, little or no maintenance.

TUTHILL SPRING CO.
760 W. POLK STREET • CHICAGO 7, ILLINOIS

LOOKING AHEAD

OCTOBER 5-8, 1953—COLUMBUS, OHIO
58th Annual Meeting, International Municipal Signal Association, The Neil House.

OCTOBER 7-9, 1953—SANTA FE, N. M.
Annual Meeting, Western Association of State Highway Officials, La Fonda Hotel.

OCTOBER 19-23, 1953—CHICAGO ILL.
National Safety Congress. Headquarters —Conrad Hilton Hotel.

Now Available

1952 Proceedings

Reprints of the 21 Papers presented at the 23rd Annual Meeting, Hotel Sherman, Chicago, Ill., September 8-11, 1952, in a 64-page 6″x9″ volume.

CONTENTS:

HIGHER STANDARDS IN TRAFFIC ENGINEERING—Lloyd F. Rader
THE NATURE OF TRAFFIC ENGINEERING—Bruce D. Greenshields
THE NECESSITY FOR APPROPRIATE HUMAN FACTOR RESEARCH TECHNIQUES IN TRAFFIC ENGINEERING—Theodore W. Forbes
THE APPLICATION OF OPERATIONS RESEARCH TO PROBLEMS IN TRAFFIC ENGINEERING—Taylor D. Lewis
TRAFFIC CHANNELIZATION—Martin E. Bruening
TRAFFIC CONTROL SIGNALS—Martin E. Bruening
TRAFFIC SIGNS FOR AN EXPRESS HIGHWAY—Edmund R. Ricker
DISCUSSION OF COMMITTEE REPORT—Taylor D. Lewis
THE NEEDS OF URBAN TRANSPORTATION—Walter P. Hedden
COSTS OF TRAFFIC INEFFICIENCIES—Wesley R. Bellis
FINANCING OFF-STREET PARKING FACILITIES—Matthew Carey
FINANCIAL PROBLEMS CONNECTED WITH STREET IMPROVEMENTS—M. L. Davis
STATE ASSISTANCE IN THE DEVELOPMENT OF FREEWAYS AND MAJOR ARTERIAL ROUTES IN URBAN AREAS IN TEXAS—M. V. Greer
CITY PLANNING ASPECTS OF TRAFFIC ENGINEERING—Ladislas Segoe
EXPRESSWAYS IN RELIEVING URBAN TRAFFIC CONGESTION—Joseph Barnett
A COMPREHENSIVE CITY TRAFFIC PLAN—Lloyd M. Braff
REPORT WRITING—Daniel R. Lang
ONE-WAY GRID SYSTEM OF PORTLAND, OREGON—Fred T. Fowler
THE BUSINESSMAN'S VIEWPOINT ON ONE-WAY STREETS—William C. Dennis
ONE-WAY STREETS ARE NOT A CURE-ALL—Ralph F. Gross
INTERSECTION DELAY—SIGNAL Vs. FOUR-WAY STOP—Edward M. Hall

Use of reprinting technique with small size type enables us to drastically cut last year's price to

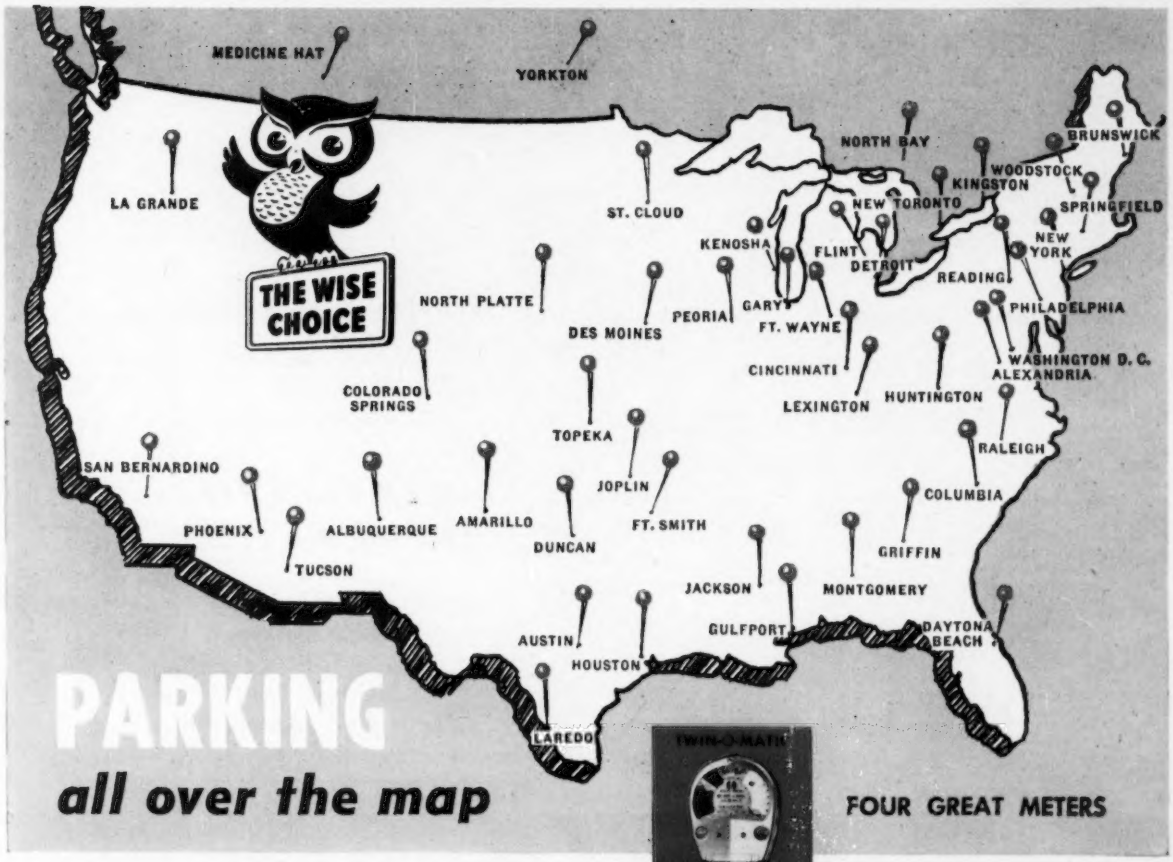
$1.50 per copy

We still have some copies of the Proceedings for past years on hand, at greatly reduced prices
1951 Proceedings at $1.25 per copy
1950 Proceedings at $1.00 per copy

Set of 1943, 45, 46, 47, 48, 50, and 51 issues at $3.50 per set

(The 1949, 1944 and issues prior to 1943 are out of print)

INSTITUTE OF TRAFFIC ENGINEERS
Strathcona Hall
New Haven 11, Connecticut



FOUR GREAT METERS

In progressive cities everywhere you'll find Karpark meters giving efficient, dependable, "trouble free" help in meeting the traffic situation. Different cities have different parking problems, and there are differences in the various areas of the same city but the KARPARK Family of Parking Meters has the answer for every need. Though KARPARKS have every worthwhile feature, the chief reason for their high preference by far sighted officials is the craftsmanship in their making. Extra care, adherence to the exacting standards of high precision work bring "extras" in reliability, accuracy, and durability. Write for full information.

TWIN-O-MATIC
One installation times two cars: has every wanted feature.

UNIMATIC
A single meter adaptation of the feature packed Twin-O-Matic.

HUSKY
Makes Karpark dependability available at a low cost investment.

SUPERIOR
The steel head meter —supreme in strength, in resistance to damage and vandalism.

KARPARK
Automatics

THE KARPARK CORPORATION • CINCINNATI 6, OHIO

IN CANADA
TWIN METER CO. OF CANADA LTD.
1224 Ropery Street
Montreal 22, Que.

Karparks are manufactured by The Herschede Hall Clock Company *makers of America's finest clocks.*

Yearbook Corrections

Through error the 1953 Yearbook lists the membership of last year's technical roster for Committee 3 M on page 10.

The correct 1953 listing is as follows:

3 M. Proper Locations for Bus Stops.
Paul L. Ristroph, Chairman

H. M. Baker	M. A. Kraft
K. A. Bevins	W. H. Miller
W. W. Dibble	M. R. Mitchell
D. J. Faustman	E. E. Olmstead
M. J. Gittens	E. M. Plettner
J. T. Hanna	C. C. Robinson

B. H. Sexton

Yearbook Changes

BATE, Stuart M. (Member)
Chief Engineer, Los Angeles Metropolitan Traffic Association, 610 South Main Street, Room, 987, Los Angeles 14, California.

CHAMBLISS, Jack W. (Junior)
Asst. Traffic Control & Safety Engineer, Mississippi State Highway Department, P. O. Box 1850, Jackson, Mississippi.

GAFVERT, C. Hartley (Assoc.)
Traffic Engineer, Engr. Dist. VI, Department of Highways. ARdmore 5880. SEND MAIL: 1524 North Second Street, Harrisburg, Pennsylvania.

GALLAGHER, John L., Jr. (Junior)
Assistant Traffic Engineer, Department of Streets & Traffic. WOodward 5-3000, Ext. 308. SEND MAIL: 19484 Schaefer Road, Detroit 35, Michigan.

GILMAN, Roger H. (Assoc.)
Deputy Director of Port Development, The Port of New York Authority, 111 Eighth Avenue, New York 11, New York. ALgonquin 5-1000, Ext. 225.

HARLESTON, Robert H., Jr. (Junior)
Area Supervisor of Transportation, State Education Finance Commission, Columbia, South Carolina. SEND MAIL: 128 Bailey Circle, Greenwood, South Carolina.

HILL, George A. (Junior)
3115 Hampshire Drive, Sacramento 21, California.

KOCH, Charles W. (Junior)
Assistant Research Engineer, Research Bureau, Pacific Electric Railway Co. TUcker 7272, Ext. 2713. SEND MAIL: 740 South Catalina Street, Los Angeles 5, California.

McDONALD, Capt. John W., Jr. (Junior)
Air Installations AO 869010 3849 Melody Lane, Riverside, California.

MOGREN, Edward G. (Junior)
Sales Engineer, Automatic Signal Division, East Norwalk, Connecticut. 6-4491. SEND MAIL: P. O. Box 133, Saugatuck Station, Westport, Connecticut.

MUSICK, V. James (Junior)
Traffic Engineer, Wright Patterson AFB, Ohio. KEnmore 7-111, Ext. 5-0118. SEND MAIL: 224 Pat Lane, Fairborn, Ohio.

PARKER, Harry (Assoc.)
Traffic Design Engineer, Los Angeles County Road Department. MUtual 9211. SEND MAIL: 3416 Beethoven Street, Venice, California.

PLETTNER, Earl M. (Assoc.)
Superintendent of Transportation, Milwaukee & Suburban Transport Corp., 940 West St. Paul Avenue, Milwaukee 3, Wisconsin. BRoadway 6-2930.

RICKER, Edmund R. (Member)
Traffic Engineer, New Jersey Turnpike Authority, New Brunswick, New Jersey. CHarter 7-0900. SEND MAIL: 19 Farmingdale Road, Fairview Knolls, Milltown, New Jersey.

SWANSON, John (Assoc.)
Div. Planning & Programming Engineer, Bureau of Public Roads, 1700 Federal Office Building, Kansas City 6, Missouri.

WHITE, Frank T. (Junior)
Asst. Highway Engineer, Calif. Division of Highways. San Francisco. UNderhill 3-0222. SEND MAIL: 2306 Ellsworth Street, Berkeley 4, California.

ZIDES, Murray (Junior)
Director of Community Planning, Province of Saskatchewan. Regina 2-3583. SEND MAIL: 3428 Mason Avenue, Regina, Saskatchewan, Canada.

MEMBERSHIP INFORMATION

may be obtained by writing to:

Executive Secretary
Institute of Traffic Engineers
Strathcona Hall
New Haven 11, Connecticut

PROTECT THEIR LIVES
WITH THE MIRO-FLEX
Safety Sue Sign
SCHOOL
15 M.P.H.
ORDER NOW
FOR FALL
Experience has shown that motorists observe and respect this message of safety. The Miro-Flex Safety Sue school zone sign offers cheap protection of the lives of your children which have no price. Like all Miro-Flex traffic control and street name assemblies it has instant legibility. Sign area is 30" x 20" with 6" letters and 8" numerals. Special copy can be inserted to your specifications if you desire. Order now and avoid rush orders during fall months.
WRITE FOR COMPLETE CATALOG
THE MIRO-FLEX CO
1824 EAST SECOND
WICHITA, KANSAS

Professional Service Directory

GANNETT FLEMING CORDDRY and CARPENTER, INC.
---ENGINEERS---
CONSULTING SERVICE FOR TRAFFIC, PARKING and TRANSPORTATION PROBLEMS
City Planning — Highways — Bridges — Flood Control
Water Supply — Sewerage — Industrial Waste — Garbage Disposal
Appraisals — Investigations — Management
600 NO. 2nd STREET HARRISBURG, PA.
Pittsburgh, Pa. Scranton, Pa. Daytona Beach, Fla. Medellin, Colombia, S. A.

EDWARDS, KELCEY and BECK
CONSULTING ENGINEERS
Surveys — Reports — Economic Studies — Design — Supervision
Transportation — Traffic — Parking — Terminals — Port and Harbor Works
Highways — Expressways — Grade Separations — Tunnels
Bridges — Water Supply — Management
3 William Street, Newark 2, N. J. • 250 Park Avenue, New York 17, N. Y.

PALMER AND BAKER, INC.
CONSULTING ENGINEERS — ARCHITECTS
NAVAL ARCHITECTS — MARINE ENGINEERS
Surveys — Reports — Design — Supervision — Consultation
Transportation and Traffic Problems Tunnels Bridges Highways Airports
Industrial Buildings Waterfront and Harbor Structures
Graving and Floating Dry Docks Vessels, Boats and Floating Equipment
Complete Soils, Materials and Chemical Laboratories
Mobile, Ala. New Orleans, La. Houston, Texas Washington, D. C.

RAMP BUILDINGS CORPORATION
PLANNING CONSULTANT
SINCE 1920
PARKING & AUTOMOTIVE SERVICE FACILITIES
MUNICIPAL PROGRAMS PRIVATE PROJECTS
Surveys — Reports — Design — Economics — Finance — Appraisals
230 Park Avenue :: New York 17, N. Y.

KNAPPEN — TIPPETTS ABBETT — McCARTHY
Engineers
Traffic, Parking and Transportation
Surveys, Economic Studies and Financial Reports
Highways, Subways, Bridges, Tunnels—Airports, Ports, Harbors, Power Developments, Water Supply, Sewerage
Planning, Reports, Design, Supervision of Construction
62 West 47th St. New York 36, N. Y. 110 Market St. San Francisco 11, Cal.

Highway Traffic Engineers, Inc.
345 Boylston Street
Brookline 46, Massachusetts
LOngwood 6-0275

DE LEUW, CATHER & COMPANY
CONSULTING ENGINEERS
Transportation, Public Transit and Traffic Problems
Subways, Railroads, Industrial Plants
Power Plants, Grade Separations,
Expressways, Tunnels, Municipal Works
150 N. Wacker Drive, Chicago 6, Ill.
79 McAllister St., San Francisco 2, Cal.

JENKINS, MERCHANT & NANKIVIL
Consulting Engineers
Municipal Improvements Sewerage
Power Development Water Systems
Traffic Surveys Industrial Plants
Flood Control Recreational Facilities
Airports Investigations and Reports
805 East Miller Street
Springfield, Illinois

PARSONS, BRINCKERHOFF HALL & MACDONALD
Engineers
Bridges, Highways, Tunnels, Airports, Traffic and Transportation Reports, Subways, Harbor Works, Dams, Canals, Power Projects, Industrial Buildings, Housing, Sewerage and Water Supply.
51 Broadway New York 6, N. Y.

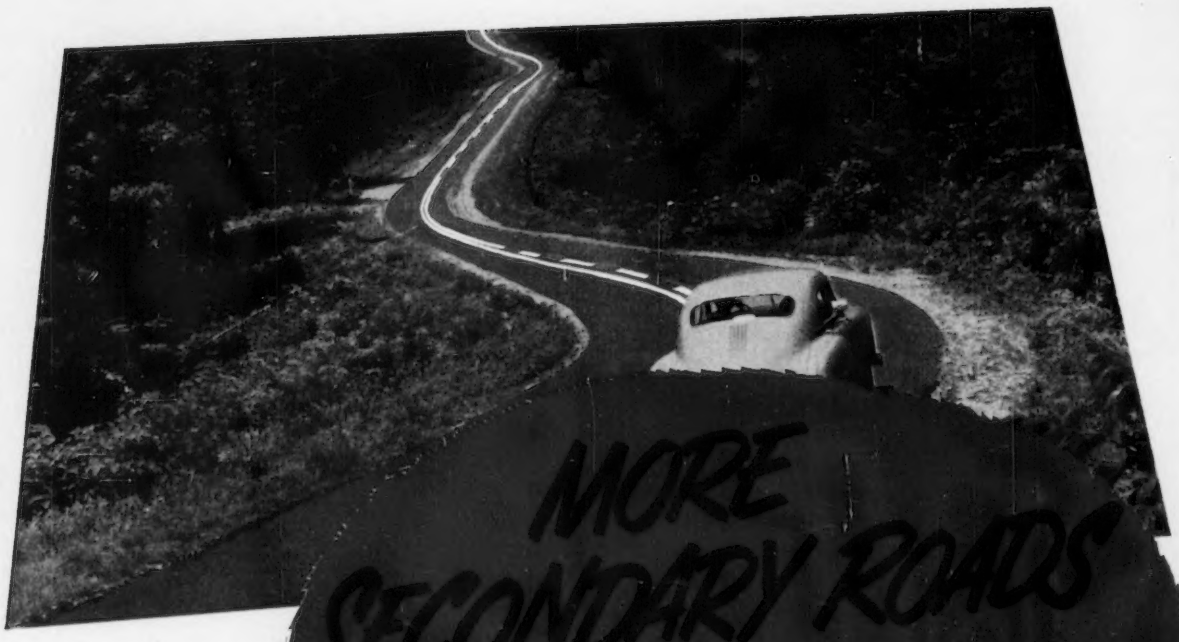
MATTHEW CAREY
MUNICIPAL FINANCE CONSULTANT
Specializing in Financing
Off Street Parking Facilities
Financial Advisor in Connection with Highland Park, Royal Oak, Wyandotte, Michigan and Kankakee, Illinois Automobile Parking System Revenue Bond Issues
Box 3703 Kercheval Station
Detroit 15, Michigan

AMMANN & WHITNEY
CONSULTING ENGINEERS
Design & Construction Supervision
Bridges, Buildings, Industrial Plants, Special Structures, Foundations, Airport Facilities, Expressways
76 Ninth Avenue, New York 11, N. Y.
724 E. Mason Street, Milwaukee 2, Wis.

Index to Advertisers

The revenue derived from the sale of advertising space assists the **Institute** in publishing TRAFFIC ENGINEERING on a regular monthly basis. The manufacturers listed below will be glad to cooperate with products and services which will be helpful to you in developing your traffic engineering and public improvement program.

A'G'A DIVISION OF ELASTIC STOP NUT CORP.	394	MINNESOTA MINING & MANUFACTURING CO.	391
AUTOMATIC SIGNAL DIVISION	397	MIRO-FLEX COMPANY, INC.	404
DUAL PARKING METER COMPANY	372	PORTABLE TRAFFIC SIGNALS, INC.	400
DUNCAN PARKING METER CORP.	Inside Front Cover	PRISMO SAFETY CORPORATION	Back Cover
GROTE MANUFACTURING COMPANY, INC.	399	STREETER-AMET COMPANY	393
KARPARK CORPORATION	403	TUTHILL SPRING COMPANY	401
MI-CO METERS	398	UNION METAL MANUFACTURING COMPANY	369
		WALD INDUSTRIES, INC.	370



MORE SECONDARY ROADS

are lined with PRISMO LIFE-LINE

than any other brand of reflective marking!

YOUR HIGHWAY SIGNS WILL SHINE BRIGHTER, LAST LONGER . . . WHEN REFLECTORIZED WITH

REFLECTO-KIT

Nothing like it! Only REFLECTO-KIT gives such powerful brilliance to *all* types of traffic signs and markers at such economical costs. Easy to apply, in the field or shop . . . many vivid, sparkling colors with "Moisture Proof" protection. Economical to start with . . . lasts for years!

You can't afford to take a back seat, when it comes to striping secondary roads. That's when you need the extra safety, dependability and durability of *Prismo Life-Line,* the first and best reflective marking, protected by Prismo's exclusive "Moisture-Proof" process. There's convincing evidence of *Prismo* superiority, on roads and highways all over America . . . proof that *Prismo* center lines reflect greater brilliance than any other marking material . . . *and last several times longer, by actual road tests!* Buy Prismo, the proven "life-saver". . . and money saver!

Write, wire or phone for complete information.

PRISMO SAFETY CORPORATION

HUNTINGDON • PENNSYLVANIA

"NOTHING EQUALS PRISMO...BUT PRISMO"

The SPHERE of SAFETY